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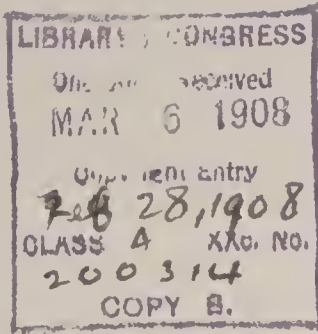
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14

652
part 7

15

A Few of the Leading Articles in Volume Four

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CATHOLIC CHURCH, ROMAN.....	JOHN J. WYNNE, S.J. Editor of 'The Messenger'
CATHOLIC CHURCH, BENEFICENT EFFECTS OF THE	JAMES, CARDINAL GIBBONS
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CHANNING, WILLIAM ELLERY.....	OSCAR FAY ADAMS Editorial Staff 'Encyclopedia Americana'
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CHARLESTON, S. C.....	HENRY TUPPER Secretary Chamber of Commerce
CHARTER OAK	ALBERT C. BATES Librarian Connecticut Historical Society
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CHATTANOOGA, TENN.....	B. L. GOULDING Vice-President Chattanooga Library Association
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CHEMICAL CRYSTALLOGRAPHY	AUSTIN FLINT ROGERS Department of Mineralogy, Columbia University
CHEMISTRY	F. W. CLARKE Chemist for United States Geological Survey
CHEMISTRY IN HUMAN PROGRESS.....	PETER T. AUSTEN Late Professor Chemistry, Rutgers College
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CHICAGO SUBWAY	GEORGE W. JACKSON Consulting and Contracting Engineer, Chicago, Ill.
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CHINESE ARCHITECTURE AND ART.....	RUSSELL STURGIS Author of 'Dictionary of Architecture'
CHOLERA	H. H. BIEDLER, M.D. Dean Baltimore University School of Medicine
CHORAL SOCIETIES.....	HENRY GORDON THUNDER Conductor Philadelphia Chorus
CHRISTIAN ARCHITECTURE.....	REV. WILLIAM J. WHITE, D.D. Brooklyn, N. Y.
CHRISTIAN CHURCH	JOEL SWARTZ, D.D. Sometime Professor of Church History, Wittenberg Theological Seminary

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CLIMATE IN THE TREATMENT OF DISEASE	SMITH ELY JELLIFFE, M.D. Editor of 'The Medical News'
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COIN AND COINAGE.....	JOHN H. LANDIS Superintendent of the U. S. Mint, Philadelphia
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COLLEGES FOR WOMEN.....	CHARLES F. THWING President of Western Reserve University
COLONIAL WARS IN AMERICA.....	SIDNEY H. CARNEY, JR., M.D. Historian of the Society of Colonial Wars
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COMMERCE, INTERSTATE	EDW. A. MOSELEY Secretary of the Interstate Commerce Commission
COMMERCIAL EDUCATION	EDMUND J. JAMES President of University of Illinois
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CONGRESS OF THE UNITED STATES.....	HON. F. M. COCKRELL Late United States Senator from Missouri
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KEY TO PRONUNCIATION.

ä	far, father	ñ	Span. ñ, as in <i>cañon</i> (căn'yõn), <i>piñon</i> (pẽn'yõn)
ā	fate, hate	ng	mingle, singing
a or ă	at, fat	nk	bank, ink
ā	air, care	ō	no, open
ạ	ado, sofa	o or ố	not, on
â	all, fall	ô	corn, nor
ch	choose, church	ò	atom, symbol
ē	eel, we	ọ	book, look
e or ě	bed, end	oi	oil, soil; also Ger. <i>eu</i> , as in <i>beutel</i>
è	her, over: also Fr. <i>e</i> , as in <i>de</i> ; <i>eu</i> , as in <i>neuf</i> ; and <i>oeu</i> , as in <i>boeuf</i> , <i>coeur</i> ; Ger. <i>ö</i> (or <i>oe</i>), as in <i>ökonomie</i> .	ö or oo	fool, rule
ẹ	befall, elope	ou or ow	allow, bowsprit
ë	agent, trident	s	satisfy, sauce
ff	off, trough	sh	show, sure
g	gas, get	th	thick, thin
gw	anguish, guava	th	father, thither
h	hat, hot	ū	mute, use
h or H	Ger. <i>ch</i> , as in <i>nicht</i> , <i>wacht</i>	u or ũ	but, us
hw	what	ù	pull, put
ī	file, ice	ü	between u and e, as in Fr. <i>sur</i> , Ger. <i>Müller</i>
i or ĭ	him, it	v	of, very
î	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din	y	(consonantal) yes, young
j	gem, genius	z	pleasant, rose
kw	quaint, quite	zh	azure, pleasure
ñ	Fr. nasal <i>m</i> or <i>n</i> , as in <i>embonpoint</i> , <i>Jean</i> , <i>temps</i>	' (prime), " (secondary)	accents, to indicate syllabic stress

THE ENCYCLOPEDIA AMERICANA

Cat'aract, in medicine, an opacity of the crystalline lens of the eye, or of its capsule, or both. It is quite different from amaurosis, which is a disease of the retina, by which it is rendered unsusceptible to the action of light. In cataract the lens becomes opaque, loses its transparency, and is no longer capable of transmitting the light. The causes of cataract are numerous. Inflammation or injury to the lens may produce it. Sometimes it is ascribed to a state of the vessels of the part which prevents a proper nourishment of the lens or its capsule. It is produced by various diseases, such as gout, rheumatism, diabetes, or scrofula, and often accompanies old age. Sometimes children are born with cataract. Its earliest approach is marked by a loss of the natural color of the pupil; this becoming turbid or slightly gray. *Musca volitantes* accompany this period. The opacity is not at first over the whole lens, but most frequently first attacks the centre portion; this being turbid and of a grayish color, while the surrounding portions remain transparent and of the usual black color. While it exists in this degree only, the person can see in an oblique direction. The color of the pupil is various; mostly grayish-white or pearl-colored; sometimes milk-white, or of a yellowish-gray; now and then of a grayish-brown, and even of a dark brown or dark gray.

The treatment of cataract is by a surgical operation on the eye, and different operations have been tried and recommended. They all consist in removing the diseased lens from its situation opposite the transparent cornea. By one of these operations the cataract is depressed, removed downward, and kept from rising by the vitreous humor. This is called couching. Another operation is extraction, and consists in making an incision of the cornea and of the capsule of the lens, by which the lens may be brought forward and through the cut in the cornea. The third operation is by absorption. This consists in wounding the capsule, breaking down the crystalline, and bringing the fragments into the anterior chamber of the eye, where they are exposed to the action of the

aqueous humor, and are at length absorbed. This last operation has the name *keratonyxis* applied to it, and is chiefly employed in the case of children, because the lenses of their eyes are soft. The choice of the operation is determined by the character of the cataract. After the operation the patient is to be kept from the light, and from all means of irritation.

Cat'aracts (from Latin, *Cataracta*, a "water-fall"), one of the names given to sudden descents in streams of water, the more general English term being fall or falls. A considerable declivity in the bed of a river produces rapids. When it shoots over a precipice it forms a cataract. If it falls from steep to steep, in successive cataracts, it is often called a cascade. In rocky countries rivers abound in falls and rapids. In alluvial districts, falls, of course, are very rare. Rapids and cataracts are often a blessing to rugged countries, since they furnish the cheapest means of driving machines in manufactories, etc. In recent times waterfalls have been utilized in the furnishing of electric power in addition to ordinary water-power. Many cataracts are remarkable for their sublimity, the grandest known being Niagara Falls (q.v.), on the Niagara River, between lakes Erie and Ontario. Some others of note are mentioned below.

The Montmorency River, which joins the St. Lawrence a few miles below Quebec, forms a magnificent cataract, 250 feet high. The Missouri, in the upper part of its course, descends 357 feet in 16½ miles. There are four cataracts, one of 87, one of 19, one of 47, and one of 26 feet high. The Yosemite River in California forms a series of magnificent falls, with a total descent of 2,600 feet. The first of them is a plunge of 1,500 feet, and is followed, after a series of beautiful cascades, by a final plunge of about 400 feet. Fully 200 miles from the mouth of the Hamilton River in Labrador there is a magnificent series of cataracts known as the Grand Falls, the largest having a height of over 300 feet. In Colombia, South America, a great cataract, that of Tequendama, is formed by the Bogotá River. The river precipitates itself through a narrow chasm, about 36 feet broad, to the depth of over 600 feet. On the Potaro

CATARMAN — CATCHFLY

River in British Guiana, the Kaieteur Fall, 740 feet high, and about 370 broad, is a splendid spectacle, and just below it is a second fall of 88 feet.

The most remarkable waterfall of Africa is one with which Dr. Livingstone's missionary travels first made us acquainted. This is a cataract on the Zambesi, called by the natives Mosioatunya ("smoke sounds here"), named by him Victoria Falls. The stream, about 1,860 yards broad, flowing over a bed of basaltic rock, is suddenly precipitated into a tremendous fissure, extending across the bed of the river from the right to the left bank, to the depth of about 370 feet. The breadth of this fissure or crack is only from 80 to 90 yards, and the pent-up waters, from which immense columns of vapor are continually ascending, are then hurried through a prolongation of the chasm to the left with furious violence. The so-called Cataracts of the Nile are not, properly speaking, cataracts. A more correct designation for them would be "rapids." The Stanley Falls on the Congo comprise seven cataracts. On the Tugela River in Natal there are the Tugela Falls. On the Umgeni River, in the same country, are the falls of the Great Umgeni (364 feet) and the Kar Kloof Falls (350). There seem to be no waterfalls of more note in Asia than those of the Cavery River of India.

One of the grandest falls in Europe is that of the Ruikanfoss ("smoking fall"), on the Maan River in Norway. The height of the cataract is 805 feet. In Sweden, on the Gotha River, a few miles below its outlet from Lake Wener, are the celebrated falls of Trollhätta, which have a height of over 100 feet. The cascade of Gavarnie, in the Pyrenees, is reputed the loftiest in Europe, being over 1,300 feet high. Its volume of water, however, is so small that it is converted into spray before reaching the bottom of the fall. Another waterfall in the Pyrenees is that of Seculéjo, in the neighborhood of Bagnères-de-Luchon. It ascends from the Lac d'Espingo, into the Lac de Seculéjo, or d'Oo, a singularly romantic mountain reservoir, from a height of 820 feet, and is the most copious of the Pyrenean waterfalls. The Swiss Alps likewise contain some falls of great sublimity. At Lauterbrunnen, in addition to numerous other cascades, is the renowned fall of the Staubbach, about 870 feet high, which, however, from its small volume of water, has none of the terrific adjuncts of a cataract, and resembles, in front, a beautiful lace veil suspended from the summit of the precipice. Near Martigny is the picturesque waterfall of the Sellesche or Pissevache, the final leap of the cascade being 128 feet. The falls of the Rhine at Schaffhausen are renowned over Europe. They are 300 feet broad, and nearly 100 feet high. In Italy the falls of Terni, or the Cascade del Marmore on the Velino, have been immortalized by Lord Byron, and though artificial, are justly regarded as among the finest and most picturesque in Europe. They consist of three falls, the aggregate height of which may be estimated at 550 feet. The falls of the Anio or Teverone, at Tivoli, are likewise very beautiful. They, too, are artificial, and have a fall of about 80 feet.

Catarman, kä-tär-män', Philippines, a town on the north coast of the Island of Samar, situated on the Catarman River, 55 miles north-

northeast of Catbalogan. It has a good anchorage ground. In 1871 the town was destroyed by a volcano which burst forth in July from low land on the west side of island, and in two months had thrown up a hill two thirds of a mile long, one third of a mile wide, and about 450 feet high, destroying all vegetation for miles around. At the time of the visit of the Challenger, January 1875, the volcano had attained height of 1,950 feet, and was still active, there being visible columns of smoke by day and series of small fires at its summit by night. Pop. 10,482.

Catarrh, ka-tär', a flow from a mucous membrane. It is a symptom purely, and not a disease, and any mucous membrane of the body may be affected by an acute or chronic inflammation, usually entitled an acute or chronic catarrh; as, catarrh of the nasal mucous membrane, of the pharynx, larynx, stomach, intestines, rectum, bladder, vagina, etc. The word has general significance only, but it is much used by vendors of nostrums. See NOSE AND THROAT.

Cataw'ba, Wateree', or Santee', a river rising in the Blue Mountains, N. C., near Morgantown. It runs east and then south into South Carolina, where it is known for some distance as the Wateree, but after the confluence of the Broad River, it takes the name of Santee, then runs east by south, and after a course of 270 miles falls by two mouths into the sea between Charleston and Georgetown. This river gives its name to a wine, the grape from which it is made having been first discovered near its sources.

Cataw'ba, a light sparkling wine, of rich Muscatine flavor, produced in several parts of the United States. It is made from the Catawba grape, first found growing on the banks of the Catawba River in the Carolinas. This wine is now in extensive use, and is gradually superseding Rhenish and French sparkling wines, to which, in general character, it bears a resemblance. See WINES.

Catbalogan, ka-tä-lō-gän, Philippines, capital of the province of Samar, situated on a small bay at the mouth of the Antigas River on the west coast. It is protected by a number of islands, Daram being the largest. The anchorage ground is not safe during the monsoon weather; Parasan Island Bay, 10 miles west, is then the refuge for vessels. The town has a large trade in hemp and cocoanut-oil with Manila, and steamers from Manila call every two weeks. Pop. 6,459.

Catch, a short piece of music written generally in three or four parts. It is a sort of short canon, the second voice taking up the theme when the first has completed the first phrase, the third following the second in same manner. These compositions are most frequently of a humorous and bacchanalian character, and have been from Purcell's time very popular in England.

Catch'fly, any one of several plants of various genera. The name is perhaps most commonly applied to species of *Silene* of the natural order *Caryophyllaceæ*, since their calyces and stems exude a clammy, sticky substance which attracts flies and holds and kills those that alight. Certain species of *Lychnis*, especially *L. viscaria*, a closely related genus, are also popularly called by this name. Sometimes,

CATEAU — CATECHISM

too, the Venus flytrap is called Carolina catch-fly. See CARNIVOROUS PLANTS; LYCHNIS; SILENE.

Cateau, kä-tō, Le, or Cateau-Cambrésis, käi-brä-zē, France, a town in the department of Nord, on the right bank of the Selle, 15 miles east-southeast of Cambrai. It was once fortified, though now open, and is famous for the treaty of its name signed here in 1559, by which Henri II. of France gave up Calais to the English; and agreed to abandon all he had conquered from Spain on condition that that country would do the like with her French conquests. Altogether France lost 189 fortified towns by the treaty. Le Cateau has manufactures of cotton, wool, merinos, cambric shawls, and a considerable trade in them, and in wine, iron, coal, and agricultural products in general. Pop. 10,500.

Catechesis, kät-ē-kē'sis, the science which teaches the proper method of instructing beginners in the principles of the Christian religion by question and answer, which is called the catechetical method. Hence catechist and catechize. The art of the catechist consists in being able to elicit and develop the ideas of the youthful mind. This part of religious science was first cultivated in modern times, and Rosenmüller, Daub, Winter, Heinrich, Müller, Schwarz, Palmer, and others, have particularly distinguished themselves by their writings upon it.

Catechetical (kät-ē-kēt'ī-käl) Schools, institutions for the elementary education of Christian teachers, of which there were many in the Eastern Church from the 2d to the 5th century. They were different from catechumenical schools, which were attached to almost every church, and which were intended only for the popular instruction of proselytes and children; whereas the catechetical schools were intended to communicate a scientific knowledge of Christianity. The first and most renowned was established about the middle of the 2d century, for the Egyptian Church at Alexandria, on the model of the famous schools of Grecian learning in that place. (See ALEXANDRIAN AGE.) Teachers like Pantænus, Clement, and Origen gave them splendor and secured their permanence. They combined instruction in rhetoric, oratory, and music, in classical Grecian literature, and the Eclectic philosophy, with the principal branches of theological study, exegesis, the doctrines of religion, and the traditions of the Church; distinguished the popular religious belief from the *Gnosis*, or the thorough knowledge of religion; established Christian theology as a science, and finally attacked the dreams of the Chiliasts (believers in a millennium); but by blending Greek speculations and Gnostic phantasies with the doctrines of the Church, and by an allegorical interpretation of the Bible, contributed to the introduction of heresies. The distraction of the Alexandrian Church by the Arian controversies proved the destruction of the catechetical schools in that place about the middle of the 4th century. The catechetical school at Antioch appears not to have been a permanent institution like the Alexandrian, but only to have been formed around distinguished teachers, when there happened to be any in the place. There were some distinguished teachers in Antioch about the year 220. We have no certain information, however, of the theological

teachers in that place, such as Lucian, Diodorus of Tarsus, and Theodore of Mopsuestia, until the latter part of the 4th century. These teachers were distinguished from the Alexandrian by more sober views of Christianity, by confining themselves to the literal interpretation of the Bible, by a cautious use of the types of the Old Testament, and by a bolder discussion of doctrines. The Nestorian and Eutychian controversies, in the 5th century, drew after them the ruin of the schools at Antioch. Of a similar character were the schools instituted at Edessa in the 3d century, and destroyed in 489, and the school afterward established at Nisibis, by the Nestorians, in its stead; both of which were in Mesopotamia. To these schools succeeded, at a later date, the cathedral and monastic schools, especially among the western Christians, who, as late as the 6th century, made use of the heathen schools, and had never established catechetical schools even at Rome.

Cat'echism, a form of instruction by question and answer, especially instruction in Christian doctrine by that method; and not the instruction only, but the book in which the questions and answers are contained. The Catechetical school of Alexandria was an institution designed to instruct pagans in the doctrines of the Christian Church (2d century). Its founder, Pantenos, was a Greek convert deeply learned in the Grecian philosophy and in the Hebrew Scriptures. Among his disciples was Titus Flavius Clemens, who became his successor as head of the school; and to Clemens (Clement of Alexandria) succeeded the illustrious Origen, who, at the early age of 18, was deemed worthy to be named to so responsible a post.

The catechetical instruction given by these masters of the Alexandrine school was conveyed rather in the form of lectures than in that of question and answer. The more familiar instruction given to catechumens in the early Church was of the same nature, but more simple and elementary. In the latter half of the 4th century St. Cyril, bishop of Jerusalem, composed 23 lectures, or in Greek *katacheseis*, of which 18 were addressed to postulants for baptism (catechumens) and five to the neophytes after their baptism. These latter he called mystagogic catecheses, or instruction in the mysteries of Christianity. They are of a more popular character than the catecheses of the Alexandrines, and are believed to be the first example of a popular compendium of the Christian doctrines.

In the Roman Catholic Church the Catechism of the Council of Trent, or Roman Catechism or *Catechismus ad Parochos* (Catechism for Parish Priests) is addressed especially to pastors and others having cure of souls, suggesting to them the manner of expounding Christian doctrine and of enforcing the precepts of Christian morality in their sermons from the pulpit and in conveying religious instruction to the young. It is also designed as a basis and model in composing short expositions of Christian doctrine for popular use among the laity. The Catechism of the Council of Trent was first published in 1566 in Latin, and formed a considerable volume, 500 pages 8vo. A decree of the Council of Trent ordered all bishops to "take care to have the Catechism faithfully translated into the vernacular language and expounded to the people by all pastors." Translations were accordingly

CATECHIST — CATEGORY

made into Italian, French, Spanish, and German. The first English translation was not published till 1829. It is a large octavo, closely printed, of over 400 pages. The work possesses high authority, but not the highest; it does not rank with the creeds of the Church or with the canons and decrees of councils or the dogmatic definitions of Popes.

All the principal divisions of Protestantism — the Anglican Church and its offshoots, the Lutheran and Calvinistic churches, the Presbyterians, Methodists, and Baptists — have catechisms. Many of these Protestant catechisms, as the Catechism of Luther, the Calvinist of Geneva, the Westminster Larger and Shorter catechisms, the Catechism of the Church of England, possess in their several churches an authority equal or comparable to that of their several creeds or confessions of faith.

Catechist. See CATECHISM.

Cat'echu, an earthy or resin-like substance, used in dyeing and calico-printing, and in medicine as an astringent. It is obtained by boiling the leaves, wood, and fruit of certain plants growing in India and other eastern countries (notably the *Acacia catechu*), and concentrating the extract by evaporation until it will solidify. Catechu (known also in the trade as "cutch") consists mainly of catechu-tannic acid, which is soluble in cold water, and catechin, which is insoluble in cold water, but soluble in hot water. In medicine catechu is of service because of the tannin that it contains. It acts as an astringent and is serviceable in diarrhoea and dysentery. Catechu is also used in lozenges for affections of the mouth and throat.

Catechumen, a person who is under instruction and probation preparatory to admission to membership in the Christian Church through baptism. On the day of Pentecost and in the early days of the Church's mission the converts to the religion of Jesus Christ were admitted through baptism to fellowship in thousands at a time, without any preliminary inquiry into their dispositions, and without any instruction in the articles of Christian belief or the new obligations contracted by admission into the Christian body. But when the first enthusiasm of conversion had cooled doubtless many were found who "walked no more" in the way of the apostles and went back to their pagan or their Jewish beliefs and practices, or worse, who after two changes of religion lapsed into open contempt of all religion and of all morality. To guard against the scandal of such apostasies the Church provided a system of preliminary graduated instruction and probation for those who desired admission to the Christian communion. The candidates for admission to the Church, to the body of the faithful (believers, *fideles*, *pistoi*) were called catechumeni (persons under instruction) and even in this class there were three or even four separate grades. There was the first grade, that of those who, having expressed a desire for admission were put under instruction privately by some officer of the Church: this class was not admitted at all to the assemblies of the faithful. Those in the second grade, that of the *acroomenoi*, *audientes*, hearers, were admitted to the assembly for worship, but were required to withdraw after the reading of the stated passages from the evangelic and apostolic books and the sermon or

exhortation by the bishop. Those of the third grade, the *gonyclinontes*, *genuflectentes*, those "bending the knee," that is, who join in the prayers of the faithful, remained in the congregation till certain prayers in the liturgy were said and the bishop had pronounced his benediction. The fourth grade included all those who, having passed the first three were to receive the rite of baptism and thereby were to be admitted to full communion with the faithful on the next stated day for administration of that sacrament: these are the *photizomenoi*, instructed, or *competentes*, or *electi*. The first two grades are not recognized as two by all Church historians.

Such a term of preliminary instruction and probation was imperatively necessary in the ages of persecution, to save the Christian body from the scandal of apostasy on the part of converts who entered the Church either from unworthy motives, as, for example to act as informers; or who entered without weighing the obligation they assumed to lead a holy life void of all offense, and who disgraced their Christian profession by their disorderly lives. The institution of the catechumenate persisted after the peace of the Church was proclaimed by the first Christian emperor, and indeed the need of it was greater now that the profession of the Christian religion seemed the gateway to honor and power in the state instead of to martyrdom. The press of candidates for admission to the Church was great; and even the children of believers like converts from the pagan religion had to pass through the catechumenal grades. Out of this grew a great abuse and a great scandal. Men who sought admission to the Church for other reasons than a desire to lead a Christian life, would enter themselves as catechumens, postulants, and would continue in that grade for an indefinite period, not pledging themselves to observance of the law of Christ and the Church till the end of their life was at hand. Nor was it the converts from paganism alone that thus deferred baptism, as Constantine did, but the children of Christian parents often followed their example. Yet the motive for deferring baptism was not always a desire to evade the obligations of the Christian profession; in very many instances the delay was prompted by a conscientious scruple lest the baptized person falling from grace afterward should commit a sin that could never be condoned: among illustrious men who for a time acted on this scruple are numbered even doctors of the Church — Saints Ambrose, Gregory of Nazianzum, Augustin.

The ancient church edifices provided for the separation of the catechumens from the faithful that were in full communion. In the ancient church of Saint Clement in Rome, the body of the building is divided off by stone constructions into the *presbyterium*, chancel or sanctuary for the clergy at the eastern end, a middle compartment for the faithful in full communion — the galleries here being reserved for the women — and in the western end, or front, a much larger compartment of the nave for the catechumens.

Category, in logic and philosophy, an assemblage of all the beings contained under any genus or kind ranged in order. Metaphysicians distribute all beings, all the objects of our thoughts or ideas, into certain genera or classes, which classes the Greeks call categories, and the Latins predicaments. The ancients, follow-

CATEL — CATFISH

ing Aristotle, generally make 10 categories. Under the first all substances are comprised, and all accidents or attributes under the last nine, namely, quantity, quality, relation, action, passion, time, place, situation, and habit. This arrangement, however, is now almost excluded. Descartes thought that all nature may be better considered under these seven divisions: spirit, matter, quantity, substance, figure, motion, and rest. Others make but two categories, substance and attribute, or subject and accident; or three, accident being divided into the inherent and circumstantial. The arrangement of the 10 categories was borrowed from the Pythagorean school. It is said to have been invented by Archytas of Tarentum. From him it passed to Plato (who, however, admitted only five categories — substance, identity, diversity, motion, and rest) and from Plato to Aristotle. The Stoics held four — subjects, qualities, independent circumstances, relative circumstances. The term categories is applied by J. S. Mill to the most general heads under which everything that may be asserted of any subject may be arranged. Of these, five are recognized by Mill; namely, existence, coexistence, sequence or succession, causation, and resemblance. This arrangement affords a general classification of all possible propositions, which must thus either affirm or deny the existence of one or more things or attributes, the coexistence, sequence, or resemblance of two or more things or attributes, or must affirm or deny that one thing is the cause of another. Causation, however, is regarded by him only as a peculiar case of succession, so that the five categories of Mill may be considered to be reduced to four, causation being omitted. For the categories of Kant, see KANT.

Catel, kä tēl, **Franz**, German artist: b. Berlin 22 Feb. 1778; d. Rome 19 Dec. 1856. His earliest efforts were designs for illustrated almanacs. He then painted in oil and water colors, and took up his abode in Rome in 1812. Overbeck, Schadow, and Cornelius gave him much encouragement, and he painted historical and genre pieces, and landscapes, in which last-named department of his art he was especially successful. During a residence in Sicily, about the year 1818, he painted a large number of views of Mount Ætna, and other prominent places on the island. He died rich, directing his fortune to be invested for the benefit of poor artists.

Cat'enary, the curve assumed by a perfectly flexible cord supported at both ends and allowed to sag between supports. The cables of a suspension bridge hang in catenaries before any of the other parts of the bridge are attached. The effect of the weight of the road-way, etc., is to draw the cables into curves more nearly approaching the parabola.

Cat'erpillar, the larva of a moth or butterfly. The body is long and cylindrical, consisting, besides the head, of 3 thoracic and 10 abdominal segments, the last one forming the suranal plate. The three pairs of thoracic legs are solid, horny, and jointed, while the supports of the abdominal segments, of which there are five pairs, are soft and fleshy. Caterpillars are very voracious, the digestive canal being very large. The American silk-worm (*Telea polyphemus*), at the end of its life as a caterpillar, has eaten not less than 120 oak leaves weighing three fourths of a pound; its food, taken in 56 days,

equals in weight 86,000 times the primitive weight of the worm. The jaws of caterpillars are large, black, horny appendages, and are toothed on the cutting edge so as to pass through a leaf somewhat like a circular saw. The eyes are minute, simple eyelets, three or four on each side of the head, and only useful, probably, in distinguishing day from night. The silk is spun through the tongue-like projection (spinneret) of the under lip. It is secreted in two long sacs within the body. The thread is drawn out by the two fore feet, which are three-jointed and end in a single claw. The legs on the hind body, sometimes called prop-legs, are fleshy, not jointed, and end in a crown of hooks which curve outward, enabling the caterpillar to firmly grasp the edge of the leaf or a twig of its food-plant. Most caterpillars are more or less hairy or spiny, rendering them, when especially so, disagreeable to birds; besides this, they are bright colored, so that birds readily recognize them and waste no time over them, but search for the common green smooth-bodied ones, which are, however, so difficult of detection by the birds that plenty are left to become moths or butterflies. Certain caterpillars, as the currant-worm, though smooth-bodied, are brightly spotted; these, however, have a disagreeable taste. The bright colors are thus danger signals, hung out to warn the birds and other enemies.

Catesby, Mark, English naturalist: b. probably in London about 1679; d. London 23 Dec. 1749. He traveled in North America in 1710-19 and 1722-6, and published 'Natural History of Carolina, Florida, and the Bahama Islands' (2 vols. 1731-43), 'British-American Flowers,' and a work on the fishes, reptiles, and insects of the isle of Providence. German translations of the first and last appeared at Nuremberg.

Catfish, any of the fishes of the order *Nematognathi*, more especially of the family *Siluridæ*. This large family is characterized by having the body naked or covered with bony plates, but without true scales. About the mouth there are two or more barbels, the longest of which are at the corners of the mouth. There is usually a stout, generally serrated, spine in front of the dorsal fin, and another in front of each pectoral fin. These spines are likely to inflict considerable injury on the careless fisherman. There is a poison-gland connected with the pectoral spine of some of the smaller species, and wounds are very painful. This is one of the most widely distributed families of fishes, and is especially abundant in South America and Africa. Most of them live in fresh waters. There are estimated to be about 1,000 species.

The catfish are sluggish in their movements, securing their prey rather by stratagem than by swiftness. They are bottom-feeders and indiscriminate, so that although, on account of their size and abundance, they constitute an important element in the fish food of the countries they inhabit, their flesh is not considered of high quality in taste. North and middle America contain 100 or more species, of which a third, perhaps, are to be found in the United States and Mexico. The majority are not of much importance, but some are of great local value. At the head of the commercial list stands the

CATGUT — CATHARI

channel cats of the genus *Ictalurus*, which are found throughout the Mississippi valley and gulf States, and are caught in vast quantities not only for home use, but for export, as much as 2,000,000 pounds annually being dressed, packed in ice, and shipped from Morgan City, La., the central mart of the Atchafalaya River fisheries, which are in operation from September to May. The method of capture is by "trot-lines" from a few yards to a mile long. The catfish move with the season's temperature of the water, going down stream in winter and up in summer. At the season of the spring floods they are carried over the swamps and adjacent lands, and thousands are caught by the shorter "brush" lines. There is a regular collecting service of tugs. The Louisiana species most taken is the chucklehead (*I. furcatus*), which loves sluggish waters. A more northerly species, ordinarily 20 to 25 pounds in weight, is the "blue" or "white" channel cat (*I. punctatus*), which thrives in the colder, swifter waters of the Tennessee, Cumberland, and neighboring rivers, whose flesh is declared equal to that of the black bass. Both these have been acclimated in California. The largest of the American species is the great fork-tailed Mississippi cat (*Amiurus lacustris*), which inhabits all the lakes and big rivers from the Saskatchewan and Great Lakes to Florida and Texas, and reaches a weight of 150 pounds or more. The so-called Potomac River cat (*A. catus*) is the one most familiar in the east, since it abounds from the Delaware River to Texas, but is most common in the waters of Chesapeake Bay and southward to Florida. It is next in commercial value to the Great Lakes fish. It has a very wide head and large mouth, but seldom exceeds two feet in length. The smaller yellow cat (*A. natalis*) and other species of this genus are numerous in the interior, but not of great importance. (See BULLHEAD.) The mud cat or goujon (*Leptope olivaris*) is a slender pike-like fish with a very large, wide head and mouth, and a thick skin, which lives in the sluggish rivers of the southern States. It is sometimes five feet long and 100 pounds in weight, but is most repulsive in appearance; its flesh, however, is excellent, and is often sold, dressed, for that of the favorite western channel cat. Other genera and species go by such names as mud-cats, stone-cats, mad toms, etc., and will be found elsewhere described, as well as many foreign species of interest and value.

Consult, besides general works, Jordan and Evermann, 'Food and Game Fishes of America,' and the publications of the United States Fish Commission.

Cat'gut is made from the intestines of different quadrupeds, particularly those of sheep. The manufacture is chiefly carried on in Italy and France. The texture from which it is made is that which anatomists call the muscular coat, which is carefully separated from the peritoneal and mucous membranes. After a tedious process of steeping, scouring, fermenting, inflating, etc., the material is twisted, rubbed with horse-hair cords, fumigated with burning sulphur to improve its color, and dried. Cords of different size, and strength, and delicacy, are obtained from different domestic animals. The intestine is sometimes cut into uniform strips with an instrument made for the purpose. To prevent offensive effluvia during the process, and to get

rid of the oily matter, the French make use of an alkaline liquid called *eau de javelle*. Catgut for stringed instruments, as violins and harps, is made principally in Rome and Naples. For the smallest violin strings three thicknesses are used; for the largest seven; and for the largest base-viol strings 120. It is well known that the membranes of lean animals are tougher than those in a high-fed condition, and there can be no doubt that from the lean and small-sized Italian sheep strings superior to all others are produced. In Naples, whence the best treble strings, commonly called "Roman," are obtained, there are large manufactories of this article.

Cath'a, a genus of plants belonging to the order *Celastraceæ*, or staff-tree family. The species are mostly natives of Africa, forming small shrubs, sometimes with spiny branches. *Catha edulis* is a native of Arabia, and from the leaves the Arabs make a beverage possessing properties analogous to those of tea or coffee. Under the name of *kât* or *cafta*, the leaves form a considerable article of commerce among the natives. Chewed, they produce wakefulness and hilarity of spirits.

Cathari, the name given to themselves by the adherents of numerous heretical sects, undoubtedly of Gnostic and Manichean origin, which swarmed in western Europe, and particularly in northern Italy and southern France in the 12th century. At that period society had much advanced in wealth and power, which brought their concomitant vices. There were many abuses prevalent in the Church, and some of the clergy led scandalous lives. The numerous heretical sects won adherents by violently and indiscriminately denouncing the entire hierarchy, from the Pope down to the monastic orders; but their tirades were not more emphatic than the philippics launched against the same scandals by sincere Catholics, their contemporaries, such as St. Bernard, St. Hildegarde, St. Malachi, archbishop of Armagh, and others. But while these sought to procure the eradication of the current abuses by a reformation from within the Church, the Cathari (Gr. *katharos*, Lat. *mundus*, *purus*, and *puritanus*, pure, clean) aimed at nothing short of the total destruction of the dominant religion, of its whole system of belief and even of its moral teaching. For not only were the sects styled Cathari (including a host of offshoots of eastern manicheism), heretics and reformers, but in their inner circles, dualists, believers in the existence of two supreme principles, the one a good principle, God, and the other an evil principle, the creator of the material world. But open profession was not made of this tenet: it was communicated only to the inner circle in the several manichean sects, to the elect ones, the *perfecti*, but withheld from the mass of their followers, the *credentes*, the faithful vulgar. To these latter and to outsiders the adepts of the *arcana* of catharism made profession of being strictly reformers of a corrupt ecclesiastical system, and of profound regard for the letter and spirit of the moral law as taught in the apostolic writings. As already said, they enthroned the evil principle as creator of the physical universe; they believed in the divine mission of Jesus Christ, the Son of God, that is, of the good principle; but with the Docetæ they denied that the Son of God had assumed human nature really, and held that his

CATHARINE — CATHARINE I.

humanity was phantasmal only. In conformity with their tenet of a supreme principle of good and a supreme principle of evil, the initiates condemned as works of the flesh, the sacraments of the Church as a whole, and looked on the contract of marriage as sinful. They held absolute predestination: that all men belong to one or other of two classes, those who will infallibly be saved, and those who cannot possibly attain holiness: hence their doctrine that an infant dying immediately after birth, if it belongs to the class of those predestined to be lost, is punished as is Judas in hell. They dared not confess that on their principles the elect cannot lose the divine favor by sin; but they did teach that repentance is of no account, and that the sins of the people are forgiven by the rite (*consolamentum*) of laying on hands. This honor was only a concession to the prejudices of the ignorant vulgar: the *perfecti*, the initiates of the *arcana* of catharism held themselves to be superior to the moral law.

Cath'arine, the name of several Christian saints: 1. ST. CATHARINE OF ALEXANDRIA, a virgin of royal descent in Alexandria, who publicly confessed the Gospel at a sacrificial feast appointed by the Emperor Maximinus, and was therefore put to death, after they had vainly attempted to torture her on toothed wheels, 307 A.D. Hence the name of Catharine wheel (q.v.). No less than 50 heathen philosophers sent by the emperor to convert her in prison were themselves converted by her winning eloquence; whence she is the patroness of philosophers and learned schools. Having steadily rejected all offers of earthly marriage, she was taken in vision to heaven, where Christ plighted his troth to her with a ring. This subject has been a favorite one with many artists (as signifying the union of the redeemed soul with Christ); the Christ being usually represented as an infant. It has been suggested that the attributes of the unhistorical St. Catharine seem to have been derived from those of the actual Hypatia, a heathen who suffered death at the hands of Christian fanatics. St. Catharine's festival falls on 25 November. 2. ST. CATHARINE OF SIENNA, one of the most famous saints of Italy, was the daughter of a dyer in Sienna, and was born there in 1347. While yet a child she practised extraordinary mortifications and devoted herself to perpetual virginity. She became a Dominican, and therefore afterward a patron saint of the Dominicans. Her enthusiasm converted the most hardened sinners, and she was able to prevail upon Pope Gregory XI. for the sake of the Church to return from Avignon to Rome. She was given, it was said, extraordinary tokens of favor by Christ, whose stigmata were imprinted upon her body. She wrote devotional pieces, letters, and poems, an edition of which is Tomasseo's (Florence 1860). Her festival falls on April 30. 3. ST. CATHARINE OF BOLOGNA (1413-63), festival March 9, and ST. CATHARINE OF SWEDEN (d. 1381; festival March 22), are of less note.

Catharine, St., Order of, the name of two organizations of very different character: (1) The Knights of St. Catharine on Mount Sinai, an ancient military order, instituted for the protection of the pilgrims who came to visit the tomb of St. Catharine on this mountain. (2) An organization in Russia, constituting a distinction

for ladies, and instituted by Catharine, wife of Peter the Great, in memory of his signal escape from the Turks in 1711.

Catharine I., Empress of Russia: b. Ringen, near Dorpat, Livonia, 15 April 1684; d. St. Petersburg 17 May 1727. The early history of this remarkable woman is uncertain. According to some accounts she was the daughter of a Swedish officer named Rabe, who died shortly after she was born; according to others her father was a Roman Catholic peasant. She at first bore the name of Martha and entered the service of a clergyman named Glück, at Marienburg, who caused her to be instructed in the Lutheran religion. Here she was married to a Swedish dragoon. But a few days after he was obliged to repair to the field, and the Russians, within a short period, took Marienburg in 1702. Martha fell into the hands of Gen. Tcheremetieff, who relinquished her to Prince Menzikoff. While in his possession she was seen by Peter the Great, who made her his mistress. She became a proselyte to the Greek Church, and assumed the name of Catharine Alexiewna. In 1708 and 1709 she bore the emperor the Princesses Anna and Elizabeth, the first of whom became the Duchess of Holstein by marriage, and mother of Peter III. The second became empress of Russia. In 1712 the emperor publicly acknowledged Catharine as his wife. She was subsequently proclaimed empress, and crowned in Moscow in 1724. Beside the daughters above named she bore the emperor five more children, all of whom died early. The Princesses Anna and Elizabeth were declared legitimate. When Peter, with his army, seemed irreparably lost on the Pruth in 1711 Catharine endeavored to win over the grand vizier; and having succeeded, by bribing his confidant with her jewels, she disclosed her plan to the emperor, who gave it his approbation, and was soon relieved. She afterward received many proofs of the gratitude of her husband. Peter even deemed her worthy of being his successor. But in the latter part of 1724 she fell under his displeasure. Her chamberlain, Moens, with whom she was suspected of being on too intimate terms, was beheaded on pretense that he had been bribed by the enemies of Russia. Menzikoff, who had always manifested much attachment to her, had now been in disgrace for some time, and Peter had very frequent attacks of bodily pain, with intervals only marked by dreadful explosions of rage. These circumstances made Catharine's situation critical, and her anticipations of the future must have been the more melancholy, as the emperor had uttered some threats of a change in the succession to her disadvantage. To prevent such an event she applied to Menzikoff; and by the prudence of Jaguschinski, a reconciliation was effected with the emperor. The empress and the favorite were laboring to confirm their improving prospects when Peter the Great died, 28 Jan. 1725. Catharine, Menzikoff, and Jaguschinski considered it necessary to keep the death of the emperor a secret until, by judicious arrangements, they had secured the succession of the throne to the empress. Theophanes, archbishop of Plescow, swore before the people and troops that Peter on his death-bed had declared Catharine alone worthy to succeed him in the government. She was then

CATHARINE II

proclaimed empress and autocrat of all the Russias, and the oath of allegiance to her was taken anew. At first the cabinet pursued the plans of Peter, and, under Menzikoff's management, the administration was conducted with considerable ability. But the pernicious influence of favorites was soon felt, and great errors crept into the administration. Catharine died suddenly, her death being probably hastened by excess in the use of ardent spirits.

Catharine II., Empress of Russia: b. Stettin 2 May 1729; d. St. Petersburg 17 Nov. 1796. She was a daughter of the Prince of Anhalt Zerbst and her name was originally Sophia Augusta. The Empress Elizabeth chose her for the wife of Peter, her nephew, whom she appointed her successor. The young princess accompanied her mother to Russia, where she joined the Greek Church, and adopted the name of Catharine Alexiewna, given to her by the empress. The marriage was celebrated 1 Sept. 1745. It was not a happy one, but Catharine found relief in the improvement of her mind. She was endowed with uncommon strength of character; but the ardor of her temperament and the ill treatment of her husband led her into errors which had the most injurious influence on her whole political life. In January 1762, the Empress Elizabeth died, and Peter III. ascended the throne. He lived in the greatest dissipation, and on such intimate terms with a lady of the court, named Elizabeth Woronzoff, that it was generally thought that he would repudiate Catharine and marry his mistress. The empress, therefore, was obliged to take measures for her personal security. At the same time Peter grew continually more and more unpopular with his subjects, which led to a conspiracy, at the head of which were the hetman, Count Rasumowski, Count Panin, the enterprising Princess Daschkoff, and a young officer of the guards, Gregory Orloff. All those who were dissatisfied, or who expected to gain by a change, joined this conspiracy. Panin and the greater part of the conspirators were actuated only by the desire to place the youthful Paul on the throne, under the guardianship of the empress and a council of the empire. But this plan was changed through the influence of the Orloffs. The guards were the first to swear allegiance to the empress on her presenting herself to them at Peterhoff on the morning of 9 July 1762; and Alexei Orloff prevailed on Teplov, afterward appointed senator, to read at the Kazan Church, instead of the proclamation of the conspirators in favor of the young prince, one announcing the elevation of Catharine to the throne. Peter died a few days after in prison. The accusation against Catharine of having contributed to hasten this event is without foundation. The young, ambitious princess, neglected by her husband, whom she did not respect, remained passive on the occasion, yielded to circumstances, which were, it is true, propitious to her, and consoled herself for an event which she could not remedy. She knew how to gain the affections of the people by flattering their vanity; showed great respect for their religion; caused herself to be crowned at Moscow with great pomp; devoted herself to the promotion of agriculture and commerce, and the creation of a naval force; improved the laws; and showed the greatest activity in

the administration of the internal as well as the external affairs of Russia. A year after her ascension to the throne she forced the Courlanders to displace their new Duke, Charles of Saxony, and to recall Biren, who was extremely odious to the nobles. After the death of Augustus III., king of Poland, she was the means of Stanislaus Poniatowski's being crowned at Warsaw. But while she was forcing this king on the Poles, the number of the malcontents in her own empire increased, and several attempts against her life were made at St. Petersburg and Moscow. The young Ivan was the person to whom the hopes of the conspirators were directed; but his sudden death at the fortress of Schlüsselburg overthrew the plans of the disaffected. After this the court of the empress was only disturbed from time to time by intrigues, in which gallantry and politics went hand in hand, and which had no other object than to replace one favorite by another. In the midst of pleasure and dissipation Catharine did not neglect the improvement of the laws. Deputies from all the provinces met at Moscow. The empress had herself prepared instructions for their conduct, which were read at the first session; but it was impossible for so many different nations to understand each other, or to be subject to the same laws. Catharine, who presided at the debates, and received from the assembly the title of mother of the country, soon dismissed the discordant legislators. About this time France formed a party in Poland against Russia; but these attempts only served to accelerate Catharine's plans. The war to which the Porte was instigated had the same result. The Turks were beaten. The Russian flag was victorious on the Greek seas; and on the banks of the Neva the plan was formed of re-establishing the republics of Sparta and Athens as a check to the Ottoman power. The advancement of Austrian troops into Poland inspired Catharine with the desire to aggrandize herself in this quarter. She therefore entered into an agreement for the division of the country with the courts of Berlin and Vienna in 1772, by which the governments of Polotzk and Mohilev fell to her share, and she insured to herself exclusive influence in Poland by undertaking to guarantee the Polish constitution. At the same time she abandoned all her conquests, with the exception of Azoph, Taganrog, and Kinburn, in the peace with the Porte, concluded at Kainardschi in 1774, but secured to herself the free navigation of the Black Sea, and stipulated for the independence of the Crimea. By this apparent independence the Crimea, became, in fact, dependent on Catharine. This peace was as opportune as it was advantageous to Russia; for in the third year of the war Moscow and several other cities were desolated by the plague; and about the same time an adventurer named Pugatscheff, assuming the name of Peter III., had excited a revolt in several provinces of eastern Russia, which was soon suppressed. At this time Potemkin exercised an unlimited influence over the empress. In 1784 he succeeded in conquering the Crimea, to which he gave its ancient name of Tauris, and extended the confines of Russia to the Caucasus. Catharine upon this traversed the provinces which had revolted under Pugatscheff, and navigated the Volga and Dnieper, taking greater interest in the expedition, as it

CATHARINE HOWARD — CATHARINE OF ARAGON

was attended with some danger. She was desirous, likewise, of seeing Tauris. Potemkin turned this journey, which took place in 1787, into a triumphal march. Throughout a distance of nearly 1,000 leagues nothing but feasts and spectacles of various kinds were to be seen. Palaces were raised on barren heaths, to be inhabited for a day. Villages and towns were built in the wildernesses, where a short time before the Tartars had fed their herds. An immense population appeared at every step — the picture of affluence and prosperity. A hundred different nations paid homage to their sovereign. Catharine saw, at a distance, towns and villages, of which only the outward walls existed. She was surrounded by a multitude of people, who were conveyed on during the night, to afford her the same spectacle the following day. Two sovereigns visited her on her journey — the king of Poland, Stanislaus Augustus, and the Emperor Joseph II. The latter renewed his promise, given at St. Petersburg, to assist her in her projects against the Turks. The result was a new Turkish war, which by the Peace of Jassy (1792), ended not less favorably for Russia than the first. The power of Russia was also increased by the war with Sweden which terminated in 1790, and by the last two partitions of Poland and the incorporation of Courland. Catharine took no part in the war against France, though she broke off all connection with the French republic, actively assisted the emigrants, and entered into an alliance with England against France. She likewise made war against Persia, and, as some historians assure us, entertained the project of destroying the power of the English in Bengal, when a fit of apoplexy put an end to her life.

Catharine II. has been equally censured and praised. With all the weakness of her sex, and with a love of pleasure carried to licentiousness, she combined the firmness and talent of a powerful sovereign. Two passions were predominant with her until her death, love and ambition. She was never without her favorite, yet she never lost sight of her dignity. She was distinguished for activity, working with her ministers, writing letters to Voltaire and Diderot, and signing an order to attack the Turks, or to occupy Poland, in the same breath. She favored distinguished authors, and was particularly partial to the French. At Paris she had a literary agent (Baron Grimm). She several times invited Voltaire to her court, proposed to D'Alembert to finish the 'Encyclopædia' at St. Petersburg, and to undertake the education of the grand-duke. Diderot visited her at her request, and she often allowed him the privilege of familiar conversation with her. By these means she gained the favor of the literati of Europe, who called her the greatest of rulers; and, in fact, she was not without claims to this title. She protected commerce, improved the laws, dug canals, founded towns, hospitals, and colleges. Pallas and others traveled at her expense. She endeavored to put a stop to the abuses which had crept into the administration of the different departments of government; but she began without being able to finish. Civilization advanced but slowly in Russia under her reign; and her anxiety to enlighten her subjects ceased when she began to entertain the idea that the French Revolution

had been brought about by the progress of civilization. Laws, colonies, schools, manufactures, hospitals, canals, towns, fortifications, everything was commenced, but frequently left unfinished for want of means. See Tooke, 'History of Catharine II.' (1803); Castara, 'Vie de Catherine II.' (1796); Tannenberg, 'Leben Catherinens II.' (1797); Herzen, 'Mémoires de l'Impératrice Catharine II.' (1859).

Catharine Howard, Queen of England. See HOWARD, CATHARINE.

Catharine Parr. See PARR, CATHARINE.

Catharine Paulowna, pow-löf'na, Queen of Würtemberg: b. 21 May 1788; d. 9 Jan. 1819. She was a daughter of Paul I. of Russia, and in 1809 married George, Duke of Holstein Oldenburg. After his death in 1812, she accompanied her brother, Alexander, on his campaigns in Germany and France (1813-14), to Paris, London, and the congress of Vienna (1815), assisting him by her talents and resolute spirit. The marriage of her younger sister to the Prince of Orange is said to have been effected by her influence. In 1816 she married William, Crown Prince of Würtemberg, whose acquaintance she had made during her travels. During the famine of 1816 in that country she proved her benevolence by the formation of female associations and an agricultural society. She was active in promoting the education of the people.

Catharine of Ar'agon, Queen of England, the youngest daughter of Ferdinand of Aragon and Isabella of Castile: b. Alcalá de Henares, Spain, 15 Dec. 1485; d. Kimbolton, Huntingdonshire, 7 Jan. 1536. In 1501 she was married to Arthur, Prince of Wales, son of Henry VII. Her husband dying about five months after, the king, unwilling to return her dowry, caused her to be contracted to his remaining son, Henry, and a dispensation was procured from the Pope for that purpose. In his 15th year the Prince made a public protest against the marriage; but at length yielding to the representations of his council, he consented to ratify the contract, and on his accession to the throne in 1509 was crowned with her. The inequality of their ages and the capricious disposition of Henry were circumstances very adverse to the durability of their union, and it seems surprising that Catharine should have acquired and retained an ascendancy over the affections of the king for nearly 20 years. The want of male issue, however, proved a source of disquietude to him, and scruples, real or pretended, at length arose in his mind concerning the legality of their union, which were greatly enforced by a growing passion for Anne Boleyn, one of the queen's maids of honor. He made application to Rome for a divorce from Catharine. But all that Henry could obtain at Rome was a promise to investigate the case. Catharine, meanwhile, conducted herself with gentleness and firmness, and could not in any way be induced to consent to an act which would render her daughter illegitimate, and stain her with the imputation of incest. Being cited before the papal legates, Cardinals Wolsey and Campeggio, in 1529, she declared that she would not submit her cause to their

CATHARINE OF BRAGANZA — CATHARINE DE MEDICI

judgment, but appealed to the court of Rome; which declaration was declared contumacious. His failure to secure the sanction of the Pope to the divorce induced the king to decide the affair for himself; and the condemnation of his conduct expressed on this occasion by the court of Rome provoked him to throw off his submission to it, and declare himself head of the English Church — an act of royal caprice and of great importance in English history. In 1532 he married Anne Boleyn; upon which Catharine, no longer considered queen of England, retired to Ampthill in Bedfordshire. Cranmer, now raised to the primacy, pronounced the sentence of divorce, notwithstanding which Catharine still persisted in maintaining her claims. Shortly before her death she wrote a letter to the king, recommending their daughter (afterward Queen Mary) to his protection, praying for the salvation of his soul, and assuring him of her forgiveness and unabated affection. The pathos of this epistle is said to have drawn tears from Henry. He had never presumed to call the virtues of his injured wife in question, and she certainly acted throughout with eminent dignity and consistency. Several devotional treatises have been attributed to Catharine which belong to Queen Catharine Parr.

Catharine of Braganza, brä-gän'zä, wife of Charles II., king of England, and daughter of John IV., king of Portugal: b. Villa Viçosa, Portugal, 25 Nov. 1638; d. Portugal 31 Dec. 1705. In 1662 she married Charles II., in whose court she long endured all the neglect and mortification to which his dissolute conduct necessarily exposed her, and which became still more galling from her having no children; still she conducted herself with great equanimity, and after the death of Charles, received much attention and respect. In 1693 she returned to Portugal, where, in 1704, she was made regent by her brother, Don Pedro, whose increasing infirmities rendered retirement necessary. In this situation Catharine showed considerable abilities, carrying on the war against Spain with great firmness and success.

Catharine of France. See CATHARINE OF VALOIS.

Catharine de Medici, dā mā'dā-chē, Queen of France: b. Florence 1519; d. Blois, France, 5 Jan. 1589. She was the only daughter of Lorenzo de Medici, Duke of Urbino, and the niece of Pope Clement VII. Francis I. consented that his son, Henry, should marry her only because he did not believe she ever would ascend the throne, and because he was in great want of money, with which Lorenzo could furnish him. The marriage was celebrated at Marseilles in 1533. Catharine was equally gifted with beauty and talents, and had cultivated her taste for the fine arts in Florence; but at the same time imbibed the perverted principles of politics then prevailing in Italy. Catharine's ambition was unbounded. She sacrificed France and her children to the passion for ruling; but she never aimed steadily at one great end, and had no profound views of policy. The situation in which she was placed, on her arrival at the French court, gave her great opportunity to perfect herself in the art of dissimulation. She flattered alike the Duchess d'Etampes, the mistress of the king, and Diana

de Poitiers, the mistress of her own husband, though these two ladies hated each other. From her apparent indifference she might have been supposed inclined to shun the tumult of public affairs; but when the death of Henry II. in 1559 made her mistress of herself, she plunged her children in a whirl of pleasures, partly to enervate them by dissipation, partly from a natural inclination toward prodigality; and in the midst of these extravagances cruel and bloody measures were executed, the memory of which still makes men shudder. Her authority was limited under the reign of Francis II., her eldest son, who, in consequence of his marriage with the unfortunate Mary Stuart, was entirely devoted to the party of the Guises. Jealous of a power she did not exercise, Catharine then decided to favor the Protestants. If it had not been for her patronage, by which the ambition of the chiefs of the Huguenots was stimulated, the conflicting religious opinions in France never would have caused such lasting civil wars. Catharine felt herself embarrassed by this indulgence toward the innovators, when the death of Francis II. placed the reins of government, during the minority of Charles IX., in her hands. Wavering between the Guises on one side, who had put themselves at the head of the Roman Catholics, and Condé and Coligny on the other, who had become very powerful by the aid of the Protestants, she was constantly obliged to resort to intrigues, which failed to procure her as much power as she might easily have gained by openness of conduct. Despised by all parties, but consoled if she could deceive them; taking arms only to treat, and never treating without preparing the materials for a new civil war, she brought Charles IX., when he became of age, into a situation in which he must either make the royal authority subordinate to a powerful party, or cause part of his subjects to be massacred, in the hope, at best a doubtful one, of subduing faction. The massacre of St. Bartholomew was her work. She induced the king to practise a dissimulation foreign to his character; and as often as he evinced a disposition to free himself from a dependence of which he was ashamed, she knew how to prevent him, by the fear and jealousy which she excited in him by favoring his brother Henry. After the death of Charles IX. Catharine became again regent of the kingdom, till the return of Henry III., then king of Poland. She contributed to the many misfortunes of his reign by the measures which she had adopted previously to its commencement, and by the intrigues in which she was uninterruptedly engaged. At her death, France was in a state of complete dismemberment. The religious contests were in reality very indifferent to her. The consequences she was not able to conceive. She was ready to risk life for the gratification of her ambition. She was equally artful in uniting her adherents, and in promoting dissension among her adversaries. To those who directed her attention to the prodigal expenditure of the public treasure, she used to say, "One must live." Her example contributed greatly to promote the corruption of morals which prevailed in her time. Her manners, however, were elegant, and she took a lively interest in the sciences and arts. She procured valuable manuscripts from Greece and Italy, and

CATHARINE OF VALOIS — CATHEDRAL

caused the Tuileries and the Hotel de Soissons to be built. In the provinces, also, several castles were erected by her order, distinguished for the beauty of their architecture, in an age when the principles of the art were still unknown in France. She had two daughters, Elizabeth, married to Philip II. of Spain in 1559, and Margaret of Valois, married to Henry of Navarre, afterward Henry IV. See Alben, 'Vita di Caterina di Medici' (1834); La Ferrière, 'Lettres de Catherine de Medicis' (1880-5).

Catharine of Valois, vâl'wä, Queen of England, youngest child of Charles VI. and Isabella of Bavaria: b. Paris 27 Oct. 1401; d. 3 Jan. 1438. In 1420 she was married to Henry V. of England, who was then declared successor to the crown of France. To this prince she bore Henry VI., crowned in his cradle king of both countries. After the death of Henry, in 1422, Catharine privately married Owen Theodore, or Tudor, a Welsh gentleman of small fortune, but descended from the ancient British princes. By this marriage she had two sons, the eldest of whom, Edmund, earl of Richmond, by a marriage with Margaret Beaufort, of the legitimated branch of Lancaster, became father of Henry VII. and founder of the house of Tudor.

Catharine-wheel, a window or compartment of a window of circular form, sometimes with radiating divisions or spokes, used in mediæval buildings, called a rose, or marigold window. It is a memorial of St. Catharine's martyrdom. The term is also applied to a kind of firework in the shape of a wheel, made to revolve automatically when lighted; a pin-wheel.

Cathar'tic, any remedy that will cause an emptying of the intestinal canal. For purposes of general description there are four classes of cathartics. These are mild cathartics, or laxatives; simple purges, drastic purges, and hydragogues. Catharsis is accomplished either by increasing the amount of water in the intestines or by stimulating the movements of the intestines — peristalsis. The laxatives are water, sugar, honey, fruits, stringy vegetables, coarse bread, cassia fistula, sulphur, figs, etc.; these act either by giving bulk, stimulation of peristalsis, or by adding water, all of the sugars attracting water from the intestinal wall. The simple purges act usually by stimulating peristalsis. These are castor oil, cascara sagrada, rhubarb, aloes, senna, iris, podophyllum, leptandra, calomel, etc. The drastic purges stimulate peristalsis, and many of them cause a flow of water into the intestine. The simple purges in large doses are drastic. Gamboge, jalap, colocynth, scammony, croton oil, and elaterium are drastics. Another class of cathartics are salty, and by osmosis attract water into the intestines; they thus act as hydragogues and are termed the saline cathartics. Those most commonly used are epsom salts, rochelle salts, magnesium oxide, citrate, sodium phosphate, tartrate, and bitartrate. Most of the mineral waters belong to this class of cathartic. In former times cholagogues were described as cathartics that "stirred up the liver secretions." It is now fairly well recognized that those drugs that stimulate peristalsis affect the gall bladder, causing it to empty itself more actively, and that the liver is unaffected. The only true hepatic stimulant that is now recognized

is ox-gall. This is frequently employed as a cathartic. Abuse of cathartics is an evil above all description. It is almost safe to assert that the injudicious use of the many patent cathartic pills on the market is responsible for more intestinal trouble than any other agent. They teach people to be careless of their intestinal functions and work incalculable injury. See CONSTIPATION.

Cathartidæ, the American vultures, a family of birds of the order *accipitres* or *Raptores*, differing from the more eagle-like Old World vultures (*Vulturidæ*) in having the beak comparatively slender, straight, and blunt, the complete absence of a septum between the nostrils, the much more largely naked head and neck, and the weak feet with elevated hallux and little curved claws. Altogether they are less predaceous birds, which feed exclusively on carrion or attack weakling animals. Five genera, each with but one or a few species, are found in America, more especially in the warmer parts. Among them are the carrion crow, the condor, and the turkey buzzard (qq.v.).

Cathay, kăth-ā', a name of which Marco Polo designated a part of Asia, probably north China.

Cath'cart, SIR **George**, son of William Shaw Cathcart (q.v.): b. London 12 May 1794; d. Inkerman, Crimea, 5 Nov. 1854. He entered the Life Guards in 1810, accompanied his father as attaché to Russia, and subsequently acted as aide-de-camp to the Duke of Wellington at Waterloo. He served in Nova Scotia and the West Indies, quelled the rebellion in Canada in 1837, and was appointed in 1852 governor at the Cape of Good Hope, where he showed ability in subduing the Kaffir insurrection. On the outbreak of the Crimean war great things were expected of him, but he fell as divisional commander at Inkerman.

Cathcart, **William Shaw**, EARL OF, English soldier and diplomatist: b. Petersham, England, 17 Sept. 1755; d. near Glasgow 17 June 1843. He studied at Glasgow, then entered the army, and served with distinction first in the American war and afterward in the campaigns against the French republic in Flanders and Germany. In 1801 he was made lieutenant-general, and in 1803 commander-in-chief for Ireland. In 1807 he was appointed commander of the land forces in the expedition against Copenhagen, and was created a viscount for his services on this occasion. In 1812 he proceeded to Russia as minister-pleni-potentiary, joined the Emperor Alexander at the headquarters of the Russian army, and accompanied him through the campaigns of 1813-14. He entered Paris with the allied sovereigns, and was present at the Congress of Vienna. The same year he was created an earl. Subsequent to this he resided for several years at St. Petersburg as ambassador to the Russian court.

Cathe'dral (Lat. *cathedra*, a "seat." Thus, "to speak ex cathedra," is to speak as from a seat of authority). A cathedral city is the seat of the bishop of the diocese, and his throne is placed in the cathedral church. From the early times of the Christian Church the bishop presided in the presbytery or the assembly of priests. He was seated on a chair, a little higher than that of the others. The whole meeting of priests was called *cathedra*; and at a later period,

CATHEDRAL — CATHELINEAU

when Christians were allowed to build churches, this name was applied to the episcopal churches, and the name *basilica* to the particular churches erected in honor of a saint or a martyr. The distinction between cathedral and collegiate churches consists principally in the see of the bishop being at the former. The governing body of a cathedral is called the dean and chapter. The cathedral is commonly, though not invariably, the most important church building, architecturally speaking, in the diocese. Its usual form is a Latin or Greek cross, and from the comparatively simple outline of the early Christian basilica has been evolved in time the complex cathedral structure of the Middle Ages. In its outline a typical cathedral exhibits nave with north and south aisles, transepts with eastern and western aisles, choir with aisles north and south, retro-choir, and eastern Lady Chapel, a lantern tower at the crossing and two towers flanking the west end of the nave. French cathedrals are distinguished by their great height, chevets, or apsidal east ends with a corona of chapels, elaborate and logical vaulting system, and, in the later Gothic styles, by extremely profuse adornment. The portals of French churches generally are lofty and imposing and richly sculptured. English cathedrals are much longer and lower than French ones, their east ends are usually square and their portals small, and, as at Wells, even insignificant.

The Church of St. John of Lateran, at Rome, founded by Constantine, is the Episcopal church or cathedral of the Pope, and bears over its chief portal the inscription, *Omnium urbis et orbis ecclesiarum mater et caput*, "mother and head of all the churches of Rome and the world." At its chief altar none but the Pope can read mass, for it covers another ancient altar at which the apostle Peter is said to have officiated. The basilica of St. Peter's at Rome may be mentioned as surpassed by no cathedral in antiquity and splendor, and equaled by none in magnitude. The length of the interior is 613½ feet, width at transept 446½ feet, height of nave 153 feet. The cathedral at Cologne was begun in the middle of the 13th century, and only partly finished in 1509, after which work was not resumed on it till 1830. In 1863 the interior was thrown open to the public. In 1880 it was finished. The structure is 511 feet long and 231 feet wide. The towers are 501 feet high. The cathedral of Dantzic was commenced in 1343 and finished in 1503. Its length is 358 feet and its height 230 feet. Notre Dame, Antwerp, was begun toward the close of the 14th century; its length is 390 feet and its width 250 feet. The cathedral at Rheims was begun in 1211 and finished in 1430. It is 466 feet long. The cathedral at Amiens dates from 1220, and is 469 feet long, with a central spire 422 feet high. The cathedral at Strasbourg was completed in 1601, and is one of the grandest Gothic structures in Europe. Its spire is 466 feet high. Notre Dame, Paris, was begun about 1163. Its length is 390 feet, width of transept 144 feet, height of vaulting 105 feet, of western towers 224 feet, width of front 128 feet, and length of nave to transept 186 feet. Salisbury Cathedral, England, founded 1220, finished in 1258, is a fine specimen. Its plan is a double cross, in extreme length, 474 feet, width of greater transept, 230 feet. Canterbury Cathedral, founded shortly after the

Conquest, is 545 feet long and the greater transept, 170 feet. It has three towers, the central one being 230 feet high. The crypts, which extend under the whole structure, are the finest in England. Ely Cathedral is 516 feet long and 190 feet wide. Lincoln Cathedral is 524 feet long outside and 482 inside. The central tower is 300 feet high. The cathedral at York is 524 feet long, 250 feet wide, and has a superb central tower. The nave is 264 feet long, 106 feet wide, and 93 feet high. St. Paul's, London (the present edifice, the first having been destroyed in the great fire of 1666), was begun in 1675, and finished in 1710. It is built in the form of a Latin cross, and is 514 feet in length. The transept is 286 feet long, and the west front 180 feet wide. The campanile towers at the west end are each 222 feet in height. The dome is 365 feet from the ground, 356 feet from the floor of the building, 145 feet in diameter, and 404 feet from the ground to the top of the cross. The Cathedral of St. Peter and St. Paul, Philadelphia, has a dome 210 feet high. At Baltimore the Roman Catholic Cathedral is 190 feet long, 177 feet wide, and 127 feet high to the top of the cross. St. Patrick's Cathedral, New York, is 332 feet long and 132 feet in general width, with an extreme width at the transept of 174 feet. It has two tall spires at the west end and is designed after the most elaborate examples of French Gothic. The Cathedral of Notre Dame, Montreal, Canada, is 255 feet long, 135 feet wide, and has two towers, each 220 feet high. The Cathedral of Mexico was begun in 1573, and was finished in 1667. It is 500 feet long and 420 feet wide. The cathedral of Lima is 320 feet long and 180 feet wide. The cathedral of St. John the Divine (Protestant Episcopal) in New York, will, when completed, be the most ambitious structure of the kind on this continent. The cathedrals of Glasgow and Kirkwall are the only complete and entire cathedrals in Scotland, exclusive of modern edifices so called. See Addis, 'Cathedrals of Scotland'; Bell, 'Cathedral Series'; Bell, 'Handbooks to Continental Churches'; Bond, 'English Cathedrals'; Gilchrist and Perkins, 'Itinerary of English Cathedrals'; Van Rensselaer, 'English Cathedrals'; Wilson, 'Cathedrals of France.'

Cathe'dral, The, a poem by James Russell Lowell. The particular cathedral which suggested the thought of the poem is that of Chartres.

Cathedral Peak, a peak of the Sierra Nevada range, situated in Mariposa County, Cal. It is of granite formation and contains the source of the Merced River. It is 11,000 feet high.

Cathelineau, Jacques, zhäk kä-tē-lē-nō, French Vendean general: b. Pin-en-Mauge, Anjou, 5 Jan. 1759; d. 11 July 1793. On the breaking out of the French Revolution he was living quietly with his family, when an unforeseen event suddenly called him forth from obscurity. In March 1793, during the levy of the conscription which the national assembly had decreed, the youth of the district of St. Florent rose in insurrection, and put the officials and *gens d'armes* to flight. They then returned home, and were awaiting the terrible revenge of the Republicans, when news of the outbreak reached

CATHERINE — CATHOLIC APOSTOLIC CHURCH

Cathelineau. He instantly determined to put himself at the head of his countrymen. Causing the alarm-bell to be rung in different places, he was soon followed by almost all the men capable of bearing arms, surprised several republican posts, carried off their cannon, and now mustered several thousand strong. As he did not deem himself equal to the post of commander, he placed himself under Bonchamp and Elbée, but after the victory of Saumur, 9 June 1793, was formally invested as commander-in-chief. On this he resolved to make a decisive attack on Nantes, and appeared before it with 80,000 men, still further increased by 30,000, whom Charette brought from lower Poitou. Notwithstanding these vast numbers, and the greatest display of undisciplined gallantry, the attack was repulsed, and Cathelineau died shortly after of the severe wounds which he had received.

Cath'etine. See CATHARINE.

Catherine Harbor, Russia, a port in the northwestern part of the empire on the Murman coast of the Kola peninsula. It was formally opened in 1900, the city having been built by imperial command. It is primarily a naval station, the harbor being a mile and a half long, 1,600 feet wide, and 70 to 160 feet deep. The port is ice free.

Cath'etine's, St., or **Santa Catharina,** an island close to the coast of Brazil, between lat. 27° and 28° S., and belonging to the province or state of Santa Catharina. It is 37 miles long and 10 broad, and contains Desterro, the state capital.

Cath'erwood, Mary Hartwell, American novelist: b. Luray, Ohio, 16 Dec. 1847; d. Chicago, Ill., 26 Dec. 1902. She was graduated from the Female College, Granville, Ohio, in 1868 and was married to John Steele Catherwood in 1887. Her especial field was the romance of American history and her writings include 'Old Caravan Days'; 'Craque-o'-Doom' (1881); 'The Romance of Dollard' (1889); 'The Story of Tonty' (1890); 'A Woman in Armor'; 'The Lady of Fort St. John' (1891); 'The Chase of St. Castin, and Other Tales' (1894); 'The Spirit of an Illinois Town' (1897); 'The White Islander'; 'Old Kaskaskia' (1893); 'The Days of Jeanne d'Arc'; 'Bony and Ban'; 'Mackinac and Lake Stories'; 'Spanish Peggy'; 'Lazare' (1902).

Cath'eter, any tubular organ used to insert into a mucous canal or hollow organ. Thus, there are nasal catheters for the nose, eustachian catheters for the internal ear, urinary catheters for the bladder. This latter is the more frequently used. Great care should be exercised in its use, that it be kept clean, to avoid cystitis (q.v.).

Cathetom'eter, in physics, an instrument for the exact measurement of small vertical distances. In its usual form it consists of a horizontal telescope, mounted so as to slide upon a fixed, graduated, upright support or post. The telescope is raised or lowered until its cross-hairs coincide with one of the objects whose difference in height is to be determined, and the position of the telescope upon the vertical, graduated post is noted by means of a vernier or micrometer. The telescope is then brought

to the elevation of the second object in the same way, and the difference in the two readings gives the desired difference in height. A cathetometer that is well designed and constructed is an instrument capable of giving very precise results when in the hands of a skilful observer. It is greatly used in accurate barometry, for determining the height of the barometric column above the mercury in the cistern.

Cath'ode, that part of a galvanic battery by which the electric current leaves substances through which it has passed, or the surface at which the electric current passes out of the electrolyte; the negative pole.

Cathode Rays. See ETHER; MOLECULAR THEORY; RADIATION; etc.

Catholic Apostolic Church, a body of Christian believers which arose in Great Britain in 1835, consisting at first of the members of a congregation of a Scotch Presbyterian Church in London and their pastor, Edward Irving (q.v.), who separated themselves from that communion and effected a new church organization under the above name. They are also commonly designated as Irvingites. They regarded the gifts or *charismata*, which were divinely bestowed upon the first Christians—"the word of wisdom, gifts of healing, workings of miracles, prophecy, discernings of spirits, divers kinds of tongues, interpretation of tongues"—and the phenomena witnessed at the assembly of the faithful when the Spirit descended upon the 11 apostles, not as extraordinary and pertaining to the Church in that time only, but as the normal manifestations of the presence of the Spirit in the assembly of the believers when they have a living faith. The little flock were confirmed in their belief by reports of occurrences in many respects like those of which the apostle Paul speaks in his first letter to the church of Corinth, quoted above—reports which were vouched for as simply true by some members of Mr. Irving's congregation who made an investigation of the phenomena. The scene of these manifestations was a meeting-house at Port Glasgow, Scotland. The gifts displayed were those of "tongues" and "prophesying." The governing body of the Scotch Presbyterian Church deposed Mr. Irving from the ministry, and shortly afterward he died. But his people persisted in their beliefs, and laid the broad foundations of the Catholic Apostolic Church. It has 4 ministries: apostles, prophets, evangelists, and pastors, each comprising 12 members. These 48 preside over the "12 tribes" of the universal Church. Each congregation, normally numbering 500 adult communicants, has its "angel" or bishop, under whom are 24 priests, 6 of each of the 4 orders or ministries of apostles, prophets, evangelists, and pastors, besides elders, deacons for the temporal affairs, and a corps of subdeacons, acolytes, singers, and doorkeepers. In the daily religious services at 6 and 9 A.M., and 3 and 5 P.M., the "low celebration," the matins, the vespers, the "proposition" of the sacrament; the "high celebration" at 10 A.M. Sundays at the "high altar"; the use of vestments, lights, incense, holy oil, etc., in all these respects the Catholic Apostolic Church aims at as pronounced a ritualism as is seen in a Cath-

CATHOLIC BENEVOLENT LEGION — CATHOLIC CHURCH

olic cathedral. The ministry with their coadjutors are supported by tithes contributed by the faithful. The Catholic Apostolic Church has spread abroad widely, claiming to have organizations in Germany, France, Switzerland, Belgium, Russia, Denmark, Sweden, Australia, India, Ireland, and the United States. The statistics of religions compiled for the New York 'Independent' in 1902 show that then it had in the United States, 95 ministers, 10 churches, and 1,394 communicants.

Catholic Benevolent Legion, a fraternal society for Roman Catholic laymen, designed to afford to the members facilities for intellectual improvement, social advancement, and such other advantages as are offered by similar non-Catholic fraternities. It was organized in 1881 and incorporated under the laws of the State of New York with 11 charter members. Twenty years later the society had 50,000 active members, and had paid to widows and orphans of 6,200 deceased members the sum of \$12,000,000. The organization is incorporated under the style of The Supreme Council, Catholic Benevolent Legion, and to the Supreme Council final appeal is made on all matters of importance emanating from State or subordinate councils. Male Roman Catholics who are personally acceptable, of sound bodily health, and between the ages of 18 and 55, are alone eligible to membership. There is a relief fund on behalf of sick and distressed members, and a benefit fund, out of which a sum not exceeding \$5,000 is paid to the beneficiaries of deceased members, and a sum not exceeding \$2,500 to a member who is permanently disabled. A subordinate council of the Catholic Benevolent Legion may be formed in any congregation or parish; a charter is granted by the Supreme Council to a group of 15 or even of 7 eligible persons who associate themselves with a view to enter the fraternity. The organization has the express approval of the Pontiff and of all the archbishops and bishops in whose jurisdictions councils of the fraternity have been formed.

Catholic Church, a phrase signifying the universal Church, the whole body of true believers in Christ; but the term is commonly used as equivalent to the Roman or Western Church. Like most other words used in ecclesiology, the term Catholic was borrowed at first from the New Testament. It occurs in some editions of the Greek original—including that issued in connection with the last revision—in the titles prefixed to the Epistles of James, 1 and 2 Peter, 1 John, and Jude, and is the word translated "general" in the King James Bible. The first to apply it to the Church was the Apostolic Father Ignatius. When he and his successors used it they meant to indicate that the Church of which they constituted a part, comprised the main body of believers, and was designed, as it was entitled, to be universal. In this sense the Church was opposed to the sects and separate bodies of heretics who had separated themselves from it and were now outside its pale. When, in the 8th century, the separation between the Eastern and Western Churches took place, the latter retained as one of its appellations the term "Catholic," the Eastern Church being contented with the word "Orthodox," still used by the Russian emperors in their politico-ecclesiastical mani-

festos. When the Protestant churches separated from their communion with Rome in the 16th century, those whom they had left naturally regarded them as outside the Catholic pale. They, on the other hand, declined to admit that this was the case, and the term "Catholic Church" is used in the English Liturgy apparently in the sense of all persons making a Christian profession.

Catholic Church, Beneficent Effects of The. We live and move and have our being in the midst of a civilization which is the legitimate offspring of the Catholic religion. The blessings resulting from our Christian civilization are poured out so regularly and so abundantly on the intellectual, moral and social world, like the sunlight and the air of heaven and the fruits of the earth that they have ceased to excite any surprise except to those who visit lands where the religion of Christ is little known. In order to realize adequately our favored situation we should transport ourselves in spirit to ante-Christian times and contrast the condition of the pagan world with our own. Before the advent of Christ, the whole world, with the exception of the secluded Roman province of Palestine, was buried in idolatry. Every striking object in nature had its tutelary divinities. Men worshipped the sun and moon and stars of heaven. They worshipped their very passions. They worshipped everything except God only, to whom alone divine homage is due. In the words of the Apostle of the Gentiles, "They changed the glory of the incorruptible God into the likeness of corruptible man, and of birds and beasts and creeping things. They worshipped and served the creature rather than the Creator who is blessed forever."

But at last the great Light for which the prophets of Israel had sighed and prayed, and toward which even the pagan sages had stretched forth their hands with eager longing, arose and shone unto them "that sat in darkness and in the shadow of death." The truth concerning our Creator, which had hitherto been hidden in Judea, that there it might be sheltered from the world-wide idolatry, was now proclaimed, and in far greater clearness and fullness, unto the whole world. Jesus Christ taught all mankind to know the one true God, a God existing from eternity unto eternity, a God who created all things by his power, who governs all things by his wisdom, and whose superintending providence watches over the affairs of nations as well as of men, "without whom not even a bird falls to the ground." He proclaimed a God infinitely holy, just, and merciful. This idea of the Deity, so consonant to our rational conceptions, was in striking contrast with the low and sensual notions which the pagan world had formed of its divinities. The religion of Christ imparts to us not only a sublime conception of God, but also a rational idea of man and of his relations to his Creator. Before the coming of Christ, man was a riddle and a mystery to himself. He knew not whence he came or whither he was going. He was groping in the dark. All he knew for certain was that he was passing through a brief phase of existence. The past and the future were enveloped in a mist which the light of philosophy was unable to penetrate. Our Redeemer has dis-

CATHOLIC CHURCH

pelled the cloud and enlightened us regarding our origin and destiny and the means of attaining it. He has rescued man from the frightful labyrinth of error in which paganism had involved him.

The Gospel of Christ as propounded by the Catholic Church has brought not only light to the intellect, but comfort also to the heart. It has given us "that peace of God which surpasseth all understanding," the peace which springs from the conscious possession of the truth. It has taught us how to enjoy that triple peace which constitutes true happiness as far as it is attainable in this life; peace with God by the observance of his commandments, peace with our neighbor by the exercise of justice and charity toward him, and peace with ourselves by repressing our inordinate appetites, and by keeping our passions subject to the law of reason, and our reason illumined and controlled by the law of God.

All other religious systems prior to the advent of Christ were national like Judaism, or state religions like paganism. The Catholic religion alone is world-wide and cosmopolitan, embracing all races and nations and peoples and tongues. Christ alone, of all religious founders, had the courage to say to his disciples, "Go teach all nations; preach the gospel to every creature. You shall be witnesses unto me in Judea and Samaria and even to the uttermost bounds of the earth. Be not restrained in your mission by national or state lines; let my gospel be as free and universal as the air of heaven. The earth is the Lord's and the fullness thereof. All mankind are the children of my Father and are my brethren. I have died for all, and embrace all in my charity. Let the whole human race be your audience and the world be the theatre of your labors."

It is this recognition of the fatherhood of God and the brotherhood of Christ that has inspired the Catholic Church in her mission of love and benevolence. This is the secret of her all-pervading charity. This idea has been her impelling motive in her work of the social regeneration of mankind. I behold, she says, in every human creature, a child of God and a brother or sister of Christ and therefore I will protect helpless infancy and decrepit old age. I will feed the orphan and nurse the sick. I will strike the shackles from the feet of the slave and will rescue degraded woman from the moral bondage and degradation to which her own frailty and the passions of the stronger sex had consigned her. Montesquieu has well said that the religion of Christ, which was instituted to lead men to eternal life, has contributed more than any other institution to promote the temporal and social happiness of mankind. Let us briefly review what the Catholic Church has done for the elevation and betterment of society.

1. The Catholic Church has purified society in its very fountain, which is the marriage bond. She has invariably proclaimed the unity and sanctity and indissolubility of the marriage tie by saying with her founder, "What God hath joined together, let no man put asunder." Wives and mothers should never forget that the inviolability of the marriage contract is the palladium of their womanly dignity and their Christian liberty. And if they are no longer the slaves of man and the toy of his caprice, like wives

in Asiatic countries, but the peers and partners of their husbands; if they are no longer tenants at will like the wives of pagan Greece and Rome, but the mistresses of the household; if they are no longer confronted by usurping rivals like Mohammedan and Morman wives, but the queens of the domestic kingdom, they are indebted for this priceless boon to the ancient Church, and particularly to the Roman pontiffs, who inflexibly upheld the sacredness of the nuptial bond against the arbitrary power of kings, the lust of nobles, and the lax and pernicious legislation of civil government.

2. The Catholic religion has proclaimed the sanctity of human life as soon as the body is animated by the vital spark. Infanticide was a dark stain in pagan civilization. It was universal in Greece with the possible exception of Thebes. It was sanctioned and even sometimes enjoined by such eminent Greeks as Plato and Aristotle, Solon and Lycurgus. The destruction of infants was also very common among the Romans. Nor was there any legal check to this inhuman crime except at rare intervals. The father had the power of life and death over his child. And as an evidence that human nature does not improve with time, and is everywhere the same unless it is fermented with the leaven of Christianity, the wanton sacrifice of infant life is probably as general to-day in China and other heathen countries as it was in ancient Greece and Rome. The Catholic Church has sternly set her face against this exposure and murder of innocent babes. She has denounced it as a crime more revolting than that of Herod, because committed against one's own flesh and blood. She has condemned with equal energy the atrocious doctrine of Malthus, who suggested unnatural methods for diminishing the population of the human family. Were I not restrained by the fear of offending modesty, and of imparting knowledge where "ignorance is bliss," I would dwell more at length on the social plague of ante-natal infanticide, which is insidiously and systematically spreading among us in defiance of civil penalties and of the divine law which says "Thou shalt not kill."

3. There is no phase of human misery for which the Church does not provide some remedy or alleviation. She has established infant asylums for the shelter of helpless babes who have been cruelly abandoned by their own parents, or bereft of them in the mysterious dispensation of Providence before they could know and feel a mother's love. These little waifs, like the infant Moses drifting on the turbid Nile, are rescued from an untimely death, and are tenderly raised by the daughters of the great King, those consecrated virgins who become nursing mothers to them. And I have known more than one such motherless babe, who like Israel's lawgiver, in after years became a leader among his people.

4. As the Church provides homes for those yet on the threshold of life, so too does she secure retreats for those on the threshold of death. She has asylums in which the aged, men and women, find at one and the same time a refuge in their old age from the storms of life, and a novitiate to prepare them for eternity. Thus, from the cradle to the grave she is a loving mother. She rocks her children in the cradle of infancy, and she soothes them to rest on the couch of death.

CATHOLIC CHURCH

Louis XIV. erected in Paris the famous Hôtel des Invalides for the veteran soldiers of France who had fought in the service of their country. And so has the Catholic religion provided for those who have been disabled in the battle of life, a home in which they are tenderly nursed in their declining years by devoted sisters. The Little Sisters of the Poor, whose congregation was founded in 1840, have now charge of 250 establishments in different parts of the globe, the aged inmates of those houses numbering 30,000, and upward of 70,000 having died under their care up to 1889. To these asylums are welcomed not only the members of the Catholic religion, but those also of every form of Christian faith, and even those without any faith at all. The sisters make no distinction of person or nationality or color or creed; for true charity embraces all. The only question proposed by the sisters to the applicant for shelter is this: "Are you oppressed by age and penury? If so, come to us and we will provide for you."

5. She has orphan asylums where children of both sexes are reared and taught to become useful and worthy members of society.

6. Hospitals were unknown to the pagan world before the coming of Christ; the copious vocabularies of Greece and Rome had no word even to express that term. The Catholic Church has hospitals for the treatment and care of every form of disease. She sends her daughters of charity and of mercy to the battlefield and to the plague-stricken city. During the Crimean war I remember to have read of a sister who was struck dead by a ball while she was in the act of stooping down and bandaging the wound of a fallen soldier. Much praise was then deservedly bestowed on Florence Nightingale for her devotion to the sick and wounded soldiers. Her name resounded in both hemispheres. But in every sister you have a Florence Nightingale with this difference, that like ministering angels they move without noise along the path of duty, and like the angel Raphael, who concealed his name from Tobias, the sister hides her name from the world.

Several years ago I accompanied to New Orleans eight sisters of charity who were sent from Baltimore to reinforce the ranks of their heroic companions or to supply the places of their devoted associates who had fallen at the post of duty in the fever-stricken cities of the South. Their departure for the scene of their labors was neither announced by the press nor heralded by public applause. They rushed calmly into the jaws of death, not bent on deeds of destruction like the famous "six hundred," but on deeds of mercy. They had no Tennyson to sound their praises. Their only ambition was—and how lofty is that ambition!—that the recording angel might be their biographer, that their names might be inscribed in the Book of Life, and that they might receive their recompense from him who has said: "I was sick and ye visited me; for as often as ye did it to one of the least of my brethren, ye did it to me." Within a few months after their arrival, six of the eight sisters died victims of the epidemic.

These are a few of the many instances of heroic charity that have fallen under my own observation. Here are examples of sublime heroism not culled from the musty pages of

ancient martyrologies, or of books of chivalry, but happening in our own day and under our own eyes. Here is a heroism not aroused by the emulation of brave comrades on the battlefield, nor by the clash of arms or the strains of martial hymns, nor by the love of earthly fame, but inspired only by a sense of Christian duty and by the love of God and of fellow beings.

7. The Catholic religion labors not only to assuage the physical distempers of humanity, but also to reclaim the victims of moral disease. The redemption of fallen women from a life of infamy was never included in the scope of heathen philanthropy, and man's unregenerate nature is the same now as before the birth of Christ. He worships woman as long as she has charms to fascinate; but she is spurned and trampled upon as soon as she has ceased to please. It was reserved for him who knew no sin to throw the mantle of protection over sinning woman. There is no page in the gospels more touching than that which records our Saviour's merciful judgment on the adulterous woman. The scribes and Pharisees, who had perhaps participated in her guilt, asked our Lord to pronounce sentence of death upon her in accordance with the Mosaic law. "Hath no one condemned thee?" asked our Saviour. "No one, Lord," she answered. "Then," said he, "neither will I condemn thee. Go, sin no more." Inspired by this divine example, the Catholic Church shelters erring females in homes not inappropriately called Magdalen asylums and houses of the Good Shepherd. Not to speak of other institutions established for the moral reformation of women, the Congregation of the Good Shepherd at Angers, founded in 1836, has charge to-day of 150 houses, in which upward of 4,000 sisters devote themselves to the care of over 20,000 females who had yielded to temptation, or were rescued from impending danger.

8. The Christian religion has been the unvarying friend and advocate of the bondman. Before the dawn of Christianity, slavery was universal in civilized as well as in barbarous nations. The apostles were everywhere confronted by the children of oppression. Their first task was to mitigate the horrors and alleviate the miseries of human bondage. They cheered the slave by holding up to him the example of Christ, who voluntarily became a slave that we might enjoy the glorious liberty of children of God. The bondman has an equal participation with his master in the sacraments of the Church, and in the priceless consolation which religion affords. Slave-owners were admonished to be kind and humane to their slaves by being reminded with apostolic freedom that they and their servants had the same Master in heaven who had no respect of person. The ministers of the Catholic religion down the ages sought to lighten the burden and improve the condition of the slaves, as far as social prejudices would permit, till at length the chains fell from their feet. Human slavery has at last, thank God, melted away before the noonday sun of the gospel. No Christian country contains to-day a solitary slave. To paraphrase the words of a distinguished Irish jurist: As soon as the bondman puts his feet on a Christian land, he stands redeemed, regenerated, and disenthralled on the sacred soil of Christendom.

CATHOLIC CHURCH

9. The Saviour of mankind never conferred a greater temporal boon on humanity than by ennobling and sanctifying manual labor, and by rescuing it from the stigma of degradation which had been branded upon it. Before Christ appeared among men, manual and even mechanical work was regarded as servile and degrading to the freeman of pagan Rome, and was consequently relegated to slaves. Christ is ushered into the world not amid the pomp and splendor of imperial majesty, but amid the environments of an humble child of toil. He is the reputed son of an artisan, and his early manhood is spent in a mechanic's shop. "Is not this the carpenter, the son of Mary?" The primeval curse attached to labor is obliterated by the toilsome life of Jesus Christ. Ever since he pursued his trade as a carpenter he has lightened the mechanic's tools and has shed a halo around the workshop.

If the professions of a general, a jurist, and a statesman are adorned, respectively, by the example of a Washington, a Taney, and a Burke, how much more is the calling of a workman ennobled by the example of Christ! What De Tocqueville said 60 years ago of the United States is true to-day, that with us every honest labor is honorable, thanks to the example and teaching of Jesus Christ.

To sum up: The Catholic Church has taught man the knowledge of God and of himself; she has brought comfort to his heart by instructing him to bear the ills of life with Christian philosophy. She has sanctified the marriage bond; she has proclaimed the sanctity and inviolability of human life from the moment that the body is animated by the spark of life till its extinction; she has founded asylums for the training of children of both sexes and for the support of the aged poor. She has established hospitals for the sick and homes for the redemption of fallen women. She has exerted her influence toward the mitigation and abolition of human slavery. She has been the unwavering friend of the sons of toil. These are some of the blessings which the Catholic Church has conferred on society.

I will not deny, on the contrary I am happy to avow, that the various Christian bodies outside the Catholic Church have been and are to-day zealous promoters of most of these works of Christian benevolence which I have enumerated. But will not our separated brethren have the candor to acknowledge that we had first possession of the field, that these beneficent movements have been inaugurated by us, and that the other Christian communities in their noble efforts for the moral and social regeneration of mankind, have in no small measure been stimulated by the example and emulation of the ancient Church?

Let us do all we can in our day and generation in the cause of humanity. Every man has a mission from God to help his fellow being. Though we differ in faith, thank God, there is one platform on which we stand united, and that is the platform of charity and benevolence. We cannot, indeed, like our divine Master, give sight to the blind, and hearing to the deaf, and speech to the dumb, and strength to the paralyzed limb, but we can work miracles of grace and mercy by relieving the distress of our suffering brethren. And never do we approach nearer to our heavenly Father than when we

alleviate the sorrows of others. Never do we perform an act more God-like than when we bring sunshine to hearts that are dark and desolate; never are we more like unto God than when we cause the flower of joy and gladness to bloom in souls that were dry and barren before. "Religion," says the Apostle, "pure and undefiled before God and the Father, is this: to visit the fatherless and the widow in their tribulation, and to keep oneself unspotted from this world." Or to borrow the words of the pagan Cicero: *Homines ad Deos nulla re propius accedunt quam salutem hominibus dando*; ("There is no way by which men can approach nearer to the Gods than by contributing to the welfare of their fellow creatures.")

JAMES CARDINAL GIBBONS.

Catholic Church, Roman. By this name is designated the large body of Christians, united in doctrine and worship under the supreme jurisdiction of the pope, the bishop of Rome. (See PAPACY.) The members of this communion are wont rather to speak of it as the "Catholic Church," but admit the term "Roman" in the sense that "to be Roman is to be Catholic and to be Catholic is to be Roman." They hold that their Church alone possesses in its fulness the system of truths, laws, and practices for the worship of God which was instituted by Jesus Christ (q.v.). Hence a brief statement of Catholic teaching on the origin, nature, and properties of the Church of Christ will enable us to understand why the Roman Catholic Church demands that all men submit to her authority as a teacher, divinely appointed to make known with absolute certainty the conditions of salvation.

From the Four Gospels, considered as trustworthy historical documents, we learn that Jesus Christ was certainly a divine messenger to all mankind, and that therefore all men are bound to receive His message with implicit submission. The doctrine which He teaches may be an enforcement of truths which man might have learned, however imperfectly, by the use of his natural powers, or may include new truths which his natural powers would never have discovered. As Christ did not remain on earth to teach all men in person, He chose a band of apostles, whom He commissioned to preach to all nations the truths He had taught them, promising His assistance unto the end of the world, and imposing upon all men, under penalty of losing their souls, the obligation of receiving His doctrine. The presence of the Holy Spirit was to preserve the Apostles from error and keep them perfectly united in their teaching.

Besides the gift of infallibility (q.v.), He conferred on them jurisdiction over all believers, the right to govern with threefold power, legislative, judicial, and executive. Moreover, they were to sanctify men by certain religious rites, called sacraments (q.v.), and for this purpose received the gift of Holy Orders (q.v.). To Peter (see SAINT PETER), one of the Twelve Apostles, was granted a primacy, not merely of honor, but of jurisdiction. On him was Christ's Church to be built; he was to feed the entire flock, the lambs, and the sheep. By thus organizing a body to teach, govern, and sanctify men under the primacy of Saint Peter, Christ founded a religious society, supernatural in aims and means, and he chose for it the special name,

CATHOLIC CHURCH

the Church. (See CHURCH, AN ORGANIZATION OF CHRISTIANS.) This society was to last even unto the day of judgment; its duty was to teach all men, wherefore the Apostles appointed their successors and transmitted to them the authority received from Christ. As the primacy of Saint Peter was the firm foundation, necessary to insure the unity and stability of the Church, it too was to last forever. The power he received was for him and his successors. There never should come a time when the doctrine of Christ would be lost through corruption.

Whence we gather that there exists to-day a religious society, empowered to teach with certainty all the truths of Christianity, and that it is a visible body, united in its government and religious teachings. The members of this society submit to its infallible teaching by profession of the faith, to its sacred ministry by the reception of baptism (q.v.) and to its ecclesiastical rule by obedience. If all men are obliged to enter this society, it is evident that Christ provided some signs, notes, or marks by which His Church can become known to all earnest inquirers, by which it can be distinguished from other associations. Christ intended that His Church should be known by Unity. It was to be one in faith, one in government, one in worship, and one in the charity uniting all its members. It was to be known by Holiness. The Church is holy in its Founder; in its aim to lead men to God; in its means of sanctification, in the heroic virtue of many members, and in the permanence of miracles among them. It was to be Catholic; that is, conspicuously diffused everywhere. Finally it was to be Apostolic. The governing and teaching body is the continuation of the Apostolic body to which Christ gave His mission and with which He promised to remain until the end of time. Whoever is not in communion with the successor of Saint Peter cannot possess union with the Apostolic body. The obligation of becoming a member of the Church is often expressed in these words: "Out of the Church there is no salvation." They do not mean that all who die out of the visible communion are lost. God does not inflict punishment but for a wilful fault, and those who without fault cannot see their obligation of joining the Church, are not to blame. If, however, anyone, knowing this obligation, refuses to comply with it, he puts himself out of the way of salvation. The same holds true for those who neglect to examine properly into a matter of so great importance.

Catholics hold that the marks of the true Church of Christ are found only in the Church in which the bishop of Rome holds the primacy. The bishops of this Church all over the world are the successors of the apostles, possessing the right to teach, to rule, and to sanctify. The gift of infallibility, that is, the right to declare that certain doctrines have been revealed by God is not personal to each bishop, but belongs only to the whole body of bishops, whether gathered in general council or not. The consent of the universal Church according to Christ's promise is a sure criterion of revelation. To the Bishop of Rome as the successor of Saint Peter belongs the primacy of jurisdiction over the whole Church, complete, supreme, ordinary, and immediate over each and all the churches of the world, over each and all the bishops and the faithful.

In this primacy is included the supreme authority as teacher of the Church, or the prerogative of papal infallibility. By virtue of a special supernatural assistance of the Holy Spirit promised to Saint Peter and his successors, the pope cannot err when, as supreme teacher of the universal Church, he defines a doctrine concerning faith or morals to be held by the whole body of the faithful. Only when these four conditions are fulfilled is the pope infallible: First, he must speak not in his private capacity, not merely in his official character, but as supreme teacher. Secondly, the matter defined must concern faith or morals. Thirdly, the judgment must be delivered with the manifest intention of commanding intellectual assent. Fourthly, the definition must be given to the whole body of the faithful. It is clear that infallibility has absolutely no connection with the pope's personal qualities and is entirely distinct from impeccability, or incapability of sinning. The extent of papal infallibility is the same as that of the Church's infallibility. It embraces all the truths that God has revealed as the object of faith, and extends to other truths and matters of faith without assurance of which it would be impossible or very difficult to preserve the deposit of revealed truth.

It follows from what we have hitherto said that whoever wishes to know Christ's doctrine must appeal to the living authority. The Church as teacher, that is, the bishops now living in union with the pope, can alone tell us what doctrines were revealed. This knowledge is not acquired from new revelations, but with the assistance of the Holy Ghost from various sources, chief among which is the preaching of the Gospel, by which the doctrines of Christ are handed down as a sacred heritage from age to age. Thus, even if nothing had ever been written, we should have to-day, uncorrupt and infallible, the means of preserving religious truth which Christ established, namely Tradition. However, it was natural that those who were commissioned to teach should also set down their teaching in writing. Hence we possess many documents and monuments from which we learn what the Church taught in past ages and what it now teaches; the truths revealed remain unchanged. Moreover, we learn from the Church that God Himself provided, by means of men, certain writings, containing revealed truth, and gave them to the Church for the instruction and direction of the faithful. (See BIBLE.) From it alone we learn what books have been so inspired and constitute Holy Scripture; the Church alone can authoritatively interpret these writings. Tradition, therefore, is prior to the Christian scriptures both in time and in thought. It is wider in its scope, for it embraces Scripture as an instrument by which tradition is handed down and on the other hand contains matters which are not in Scripture. First and principally, tradition teaches us the authoritative character of Scripture itself. Even were all the copies of Scripture destroyed, the living voice would still proclaim the entire Christian teaching. Catholics yield to none in their esteem of Holy Writ, as the inspired word of God, but they so esteem it because of what they learn concerning it from tradition. The chief sources from which this tradition is learned are the acts of councils, the writings of the

CATHOLIC CHURCH

popes, of the Fathers of the Church, inscriptions, monuments, pictures, liturgies, rites, and pious customs, in a word, every way in which the Church is wont to profess her faith.

The Chief Doctrines of the Catholic Faith. — Catholics believe in one, true, living God, the Creator and Lord of heaven and earth and of all things visible and invisible, almighty, eternal, immense, and incomprehensible; infinite in will and intellect, and in all perfection, who, being one, singular, absolutely simple and unchangeable spiritual substance is to be regarded as distinct really and in essence from the world, infinitely happy in and from Himself and unspeakably elevated above all things that exist or can be conceived. He knows all things in the most perfect manner, by one all-embracing act of His intellect, from eternity to eternity ever the same. He knows His own being, all things that are possible, past, present, and future, and all things that are not and never have been nor will be, but which would be if some condition were fulfilled. He is all-wise, all-holy, all-just, true, faithful, and bountiful. Moreover, in God as there is one divine nature, so there are three divine persons, Father, Son, and Holy Ghost, really distinct from one another, perfectly equal to one another. Nevertheless there are not three Gods, but one God. The father is unbegotten, the Son is begotten of the Father, and the Holy Ghost proceeds from the Father and the Son. (See TRINITY, DOCTRINE OF THE.) This one true God of His goodness and by His omnipotent power, not in order to increase His happiness, not to acquire perfection, but to manifest it by the good which He imparts to His creatures, in accordance with His absolutely free decree, at once from the beginning of time framed out of nothing as to the whole of their substance, two kinds of creatures, spiritual and material, the angels and the world, and then man, in whom spirit and matter were united. God preserves and governs by His providence all things that He has created.

To the angels He gave sanctifying grace and with it the power to merit eternal happiness by free service. Many of them rebelled and were cast into everlasting fire, the rest were confirmed in grace and admitted to the beatific vision of God. God "formed the body of the first man out of the slime of the earth." He created his soul immediately, as He creates the soul of every man; the soul is a spirit, endowed with intellect and free-will, and immortal. All men are descended from Adam (q.v.) and Eve. Like the angels, our first parents were also raised to a supernatural state by the infusion of sanctifying grace into their souls, being made adopted children of God, destined to the enjoyment of the beatific vision. This is the principle of supernatural life, whereby man can produce works that merit a heavenly reward. Moreover, God bestowed on man other preternatural gifts: great powers of mind and infused knowledge, complete control of the passions, immortality, and exemption from suffering and decay. This original justice our first parents lost by mortal sin, that is, by a grievous, wilful violation of God's law; in consequence of Adam's sin all of his descendants were deprived of those privileges, are conceived in original sin, and cannot of themselves enter the kingdom of heaven.

To atone adequately for the grievous insult to God and to repair the evil done to mankind, the second person of the Trinity became man. Jesus is true God and true man, one Divine Person subsisting in two natures, divine and human, not by the conversion of Divinity into flesh, but by the assumption of humanity unto God. He was born of the Virgin Mary, who was truly the Mother of God and remained a Virgin in conceiving and bearing her divine Son and ever after till the end of her life. By singular privilege of God through the merits of Christ, the Redeemer, the Blessed Virgin was preserved free from original sin (q.v.), that is, in the first moment of her conception, when her soul was created, it was endowed with sanctifying grace. By further privilege she was never guilty of any actual sin, mortal or venial. See MARY; IMMACULATE CONCEPTION.

Christ, the God-man, became our Redeemer, not by the mere effect of His preaching and example, but by His bloody death on the cross. He made Himself our mediator with His Father, offering atonement for the sins of all men. This satisfaction is not applied to those who have use of reason without their free employment of the means ordained by Christ. He merited for us the remission of sins, sanctifying grace, and all other graces conferred on man. After His death, He rose again on the third day, ascended into Heaven, where He sits at the right hand of the Father, whence He shall come with glory to judge the living and the dead, and of His kingdom there shall be no end. He founded a Church and confided to it the task of teaching His doctrines and applying to men's souls the means of sanctification. This Church is the guardian and interpreter of revelation; for though the existence of God can be known with certainty by the light of reason, it has pleased the Divine Wisdom to reveal many natural truths as well as all those that regard our supernatural life. This revelation is contained both in written books and in unwritten traditions. The books of the old and New Testament, held by the Church to be sacred and canonical, were written by the inspiration of the Holy Ghost and have God as their author. In matters of faith and morals the true meaning of Scripture is that which is maintained by the Church. All interpretations at variance with the unanimous consent of the Fathers, when they speak as witnesses of tradition, are false and forbidden.

Whatever is presented to us by the Church as revealed truth must be accepted by the free assent of the intellect, not because of its intrinsic truth seen by the light of reason, but on the authority of God who has given the revelation, and who can neither be deceived nor deceive. This divine revelation has been made credible by external proofs, especially by miracles and prophecies; yet as faith is a supernatural virtue, the act of faith requires the assistance of divine grace, enlightening the intellect and strengthening the will and making our act supernatural. Without faith there is no justification, but as God wishes all men to be saved, all receive, either proximately or remotely, the grace to believe. Among revealed truths some are mysteries that cannot be demonstrated by human reason, but must be believed. The demonstrations of reason cannot contradict

CATHOLIC CHURCH

revelation, hence any assertions of human science that are at variance with what the Church teaches to be revealed must be false.

As grace is necessary for the beginnings of faith, and even for the pious affection toward believing, so it is needed to make our good works deserving of a supernatural reward. Grace is needed even for the just to avoid sin. Final perseverance is a special privilege of dying in the state of grace. Apart from a special revelation, no one can know that he will receive this blessing. Without grace, however, it is possible to resist less urgent temptations and perform acts that have natural goodness; hence all works done before justification are not sins. According to Catholic doctrine, actual grace is a real influence exerted by the Holy Ghost upon the soul, but it does not destroy the free-will of man. A grace may be fully sufficient for a supernaturally good act, but if a man refuse to act with it, the grace will not be efficacious. God will not save us without our co-operation. See **GRACE OF GOD**.

Actual graces aid us to obtain habitual or sanctifying grace, that is, to be justified by the remission of original sin or of grievous actual sin. This sanctifying grace makes us like unto Christ, holy and supernaturally pleasing to God, and brings with it the infused virtues and the gifts of the Holy Ghost (q.v.). There are many grades of habitual grace; it may be increased by good works, and on the other hand may be entirely lost by mortal sin. God in His mercy offers to man supernatural happiness and makes this offer known by the preaching of His Church, which he accompanies by an interior stirring grace. When a man co-operates with this grace, he believes the truth with absolute certainty and is moved by the thought of God's love; he sees reasons to fear God's justice and throws himself on God's mercy, trusting in the merits of Christ; hence he conceives a love of God and a detestation of sin. Thus by the working of grace and the co-operation of man's free will, the way is prepared for justification; and, provided that man puts no obstacle, the Holy Ghost works this justification by infusing charity into his soul, thereby destroying sin. Thus purified, he enters on a virtuous life, hoping by the merits of Christ to enter heaven, but he has no absolute certainty of his salvation.

In the process of justification, the first grace cannot be merited at all; for no supernatural reward is due to natural acts. With the aid of grace both sinners and just can merit further actual grace, but only congruously and not with any strict right in justice. The just, that is, those in a state of grace, can merit final perseverance congruously, and, because of God's promises, can merit in justice the increase of habitual grace, eternal life, and increase of glory. By mortal sin, all merit is lost.

As a means of justification Christ has entrusted to His Church seven Sacraments (q.v.), or sensible rites, instituted by Him to effect in the soul the grace which they signify. When the necessary conditions are placed, the Sacrament works by its own efficacy and not through the piety of the minister nor of the recipient. The Sacraments are Baptism, Confirmation, Holy Eucharist, Penance, Extreme Unction, Holy Orders, and Matrimony. Baptism and Penance remit sin; the others cannot lawfully be received in mortal sin. Baptism, Confirma-

tion, and Holy Orders can be received only once, because they imprint on the soul an inefaceable mark, called the sacramental character. All the Sacraments, if properly received, give sanctifying grace or increase it, if already in the soul. Since the promulgation of the Gospel, justification cannot be obtained without Baptism of water, which blots out original sin and all actual sin. Infants who die without Baptism cannot enjoy the supernatural vision of God. In adults, when baptism of water cannot be received, pardon of sin can be obtained by the baptism of desire, which consists in a perfect love of God and a sorrow for sin, including, at least implicitly, the desire of the Sacrament. Remission of sin is also granted to all who suffer martyrdom for Christ. Sins committed after baptism are remitted by the Sacrament of Penance (q.v.), in which the sinner confesses with contrition all his mortal sins to the duly authorized priests of the Church, from whom he receives absolution. Sins are also remitted by perfect contrition, but the obligation of Divine Law requires that even then, if possible, they must be confessed. Penance pardons the guilt of sins confessed and repented of, infuses or increases sanctifying grace, remits eternal punishment, if it was due, secures actual graces to avoid sin in future, and may also remit, wholly or in part, the temporal punishment still to be undergone for sins the guilt of which has been pardoned. The whole punishment is not always remitted with the fault; for the remaining debt satisfaction is made to God by sufferings patiently borne or voluntarily inflicted. For this purpose also the Church has the power of granting indulgences, which are not a remission of sin, much less a permission to commit sin, but the remission of the whole or part of the temporal punishment which may be due for sins, after the guilt has been pardoned. See **INDULGENCE**.

In the Holy Eucharist there is really and substantially present the Body and Blood, Soul and Divinity of our Lord Jesus Christ, under the appearances of bread and wine. By the words of the priest at the consecration, there is effected a conversion of the whole substance of the bread into the Body and of the whole substance of the wine into the Blood, which conversion is called transubstantiation (q.v.). By force of the words, the Body is under the species of the bread and the Blood under the species of the wine, but in virtue of the natural connection and concomitance by which the parts of Christ are linked together, He exists whole and entire under each species and every part of the species. In the Mass (q.v.) there is offered to God a true, proper, and propitiatory sacrifice for the living and the dead. To offer up this sacrifice, Christ instituted a visible and external priesthood and the Sacrament of Holy Orders (q.v.); the minister of this Sacrament must be a bishop, who has received the fulness of the sacred ministry. The various orders constitute the Hierarchy. Priests cannot ordain or confirm. Other orders are the diaconate, subdiaconate, and the minor orders (Acolyte, Exorcist, Lector, and Ostiarius). Before the minor orders, the tonsure is conferred as a sign of enrolment among the clergy, who are separated from the rest of the faithful, called the laity. The right to exercise the sacred functions within appointed limits is

CATHOLIC CHURCH

called jurisdiction; it is required for the lawful performance of all functions and for the validity of some. The Roman pontiffs have, by Divine institution, universal jurisdiction. The other bishops have power to govern the dioceses to which they have been assigned by the pope.

Marriage between Christians was raised by Christ to the dignity of a sacrament. Its essence lies in the contract freely made between man and wife; the grace conferred is first an increase of sanctity, and, secondly, actual grace to fulfill the duties of the married state. The bond of Christian marriage after consummation is absolutely indissoluble; it is also exclusive, no man can have several wives, no woman several husbands, at the same time. Those who, with the aid of God's grace, fulfil the obligations of virginity or celibacy live in a state more holy and better than the state of matrimony. From the fact that Christian matrimony is a Sacrament, it follows that it has been intrusted to the Church and is subject to the laws of the Church, not to those of the State; hence the Church has the power of assigning conditions necessary for the validity or lawfulness of the contract between those who have been baptized. See MARRIAGE.

The means of sanctification are given to men to enable them to live and die in the state of sanctifying grace. At the hour of death each soul is judged by Christ, and if in mortal sin, is condemned to hell to be punished by eternal torments, varying in intensity according to the degree of guilt. Those who die free from all sin, mortal and venial, and from all the temporal punishment for sin, are admitted at once to life everlasting, to perfect beatitude in the vision of God. The saints and angels in heaven offer up prayers for men, and it is good and useful to invoke their intercession that we may obtain favors from God through Jesus Christ, who is our sole Redeemer and Saviour. Catholics honor and worship the saints and angels, and especially the Blessed Virgin Mary, because God loves and honors them, and because of their own personal sanctity; not, however, with the supreme worship that belongs only to God. Because of their special connection with holy persons, honor is also given to relics of the saints, to images and paintings of Christ and His saints. If men die in venial sin, or temporal punishment be still due, their souls are detained in Purgatory (q.v.) until expiation is made. In this state they can no longer merit for themselves, but can be assisted by the prayers and good works of the faithful and particularly by the holy sacrifice of the Mass. The Church has the power to apply indulgences for their relief. In addition to the particular judgment, immediately after death, there will be a general judgment at the end of the world. The body will rise from the grave reunited to the soul, and share for eternity either happiness in heaven or punishment in hell.

The chief duties of Christian life are expressed in the Ten Commandments of God and the commandments of the Church. Many laws have been imposed by the Church on particular classes or for special purposes; all Catholics, however, are bound, under pain of mortal sin, to hear Mass and rest from servile work on Sundays and Holydays of obligation, to fast and to abstain from certain food on the days

appointed, to confess all mortal sins at least once a year, and to receive the Holy Eucharist during the Easter time.

A Catholic must believe all the truths God has revealed and teaches through His Church. Denial of one such would mean either the denial of God's veracity or of the Church's infallibility. But it is not necessary that he should know explicitly more than the principal truths; all others are included in his acceptance of the Church as a divine teacher, alone capable of declaring what truths are contained in the *deposit of faith* handed down from the apostles. The definition of a dogma by the Church brings no change in doctrine; for no truth once taught as of faith is ever given up nor can any point be added which was not contained, at least implicitly, in the original teaching. However, the Church's infallibility is not limited merely to revealed doctrines; she can also speak infallibly on matters necessary to safeguard revealed teaching. Belief in such decisions is called ecclesiastical faith. Outside the domain of divine or ecclesiastical faith, there are many subjects of pious belief among Catholics. Some of these may perhaps belong to the deposit of faith, but they are not yet authoritatively proposed. Others depend on human testimony, and are accepted with that degree of certitude which the testimony warrants.

In the expression of revealed truths and in the defense of faith from the charge of conflict with demonstrated truths of science and philosophy, the Church makes use of terms derived from the philosophy current among its subjects. Thus it has come about that the dogmas are expressed in the terms of scholastic philosophy and officially in the Latin language. As its doctrines can be taught in any language, so, too, the expression of them may be harmonized with whatever is found to be true in any system of philosophy.

In the worship, liturgies, discipline, and practices of the Church, some regulations may be of divine origin, others are of ecclesiastical origin, and still others arise from the voluntary piety of individuals. Besides the ordinary obligations of Christian life, she invites those of her children who feel the call from God to bind themselves by vow to His service. The principal vows are those taken to observe the evangelical counsels of poverty, chastity, and obedience. Those who have thus bound themselves in approved congregations or religious orders are called *religious*. (See ORDERS, RELIGIOUS.) As a matter of discipline all those in Sacred Orders in the Latin portion of the Church are bound to observe celibacy. In the Greek portion, to-day, no priest can marry, but married men may receive Holy Orders, except episcopal consecration.

External Organization of the Church.—Supreme jurisdiction, as we have seen, resides in the Pope; the bishops are the rulers of dioceses, which are subdivided into parishes or missions under a parish priest or rector, assisted by curates. The dioceses are united into provinces, over each of which is an archbishop or metropolitan, the other bishops being called his suffragans. The archbishop convokes provincial synods, hears certain appeals from the episcopal court, watches over the observance of ecclesiastical law in some particulars, and, under certain circumstances, appoints an administrator when a

CATHOLIC CHURCH

suffragan dies. The patriarchate is to-day only an honorary rank. The Pope is represented in some countries by apostolic delegates, to whom are referred appeals from the lower courts and through whom the Pope sends his communications. In some countries there are apostolic nuncios, who deal directly with the various governments that have their representatives at Rome.

The Pope is assisted immediately by the Sacred College of Cardinals and by the Sacred Congregations. The College of Cardinals, when complete, contains 70 members: 6 Cardinal Bishops of the Suburban Sees, 50 Cardinal Priests, and 14 Cardinal Deacons. The Sacred Congregations, 21 in number, are committees of Cardinals to whom special affairs are entrusted. They were arranged, almost as at present, by Pope Sixtus V. The Cardinals alone cast votes for the final decisions, but they are assisted by secretaries and consultors. The Pope himself acts as prefect of some congregations (the Inquisition, the Apostolic Visitation, and the Consistorial). A Cardinal presides over each of the others. The acts of all congregations are submitted to the Pope for his approval. These acts, unless promulgated in a solemn manner as the acts of the Sovereign Pontiff himself, are subject to change; though not infallible, they must be received by the faithful with an internal assent, such as is due to religious authority and obeyed as laws of the Church. The more important congregations are: the Holy Roman Inquisition (the supreme tribunal to judge of heresy and crimes allied with heresy), the Consistorial (which selects the matters that are presented and sanctioned by the College of Cardinals assembled in the Papal Consistories), the Apostolic Visitations, Bishops and Regulars, the Council of De Propaganda Fide (which cares for missionary countries), Sacred Rites, the Index (which prohibits the reading of books condemned as contrary to faith or good morals), Indulgences and Relics, and the congregation of Studies.

The Church and Civil Authority.—The Church was established by Christ as a perfect, independent religious society. Its authority depends on God's ordinances alone; wherefore it has always denied any right on the part of the state to interfere in its internal affairs. In Catholic countries, the church claims immunity for its officials from the authority of civil tribunals; in past ages this immunity was often absolutely necessary for their just protection. Sometimes the Pope makes a Concordat with temporal rulers; that is, a treaty whereby, in consideration of certain promises of these rulers, the Pope abstains from urging certain of his rights. To exercise the prerogatives which we have described, the Pope, his Cardinals, and other officials must be exempt from the jurisdiction of any civil tribunals. Practically this cannot be secured without the Temporal Power (q.v.), or better, the Temporal Independence of the Sovereign Pontiff. It is not enough for the Pope to be free, he must be known to be free: suspicion of being under the influence of a sovereign would be fatal to his influence. This independence he possessed for more than 15 centuries; it was assured by the recognition of his sovereign authority in the states of the Church. Since the usurpation of these states by the Italian Government, the Popes, Pius IX., Leo

XIII., and Pius X., have not ceased to proclaim: (1) that this seizure was an act of injustice; (2) that the Pope no longer possesses the freedom, security, and independence demanded by his dignity, his rights, and for the proper exercise of his authority; and (3) that the Holy See must insist on these facts and look forward to some efficient remedy for the injustice and indignity of present conditions. To deal rightly with Catholics of all nations, the Pope must be extra-national. As the seat of our general government, the District of Columbia, is independent of all the States, so the seat of the general government of the Church should be independent of all the countries of the earth.

History.—The history of the Roman Catholic Church may be divided into three great epochs: (1) Christian Antiquity, embracing the first seven centuries, during which Christian civilization was chiefly Greek and Roman. (2) The Middle Ages, from the 8th century to the 16th, characterized by the church's action among the various peoples of north and central Europe, who were molded into organized nations by her influence. (3) The Modern Age, from the rise of Protestantism to the present day, during which the Germanic nations separated from the Church and attached themselves to various sects, and the Church has had to struggle against the modern, infidel spirit in science and government.

The first epoch contains two periods. First comes an era of persecution, during the struggle with paganism, which was terminated by the edict of Milan (313); then, an era of development in definitions of dogma against the attacks of heresy. The second epoch embraces four periods: I. The conversion of the barbarians. II. The development of the Western Empire and the Church's struggle to maintain her independence (800-1073). III. The supremacy of the Church maintained (1073-1300). IV. Attacks on the Church's supremacy, from Boniface VIII. to Protestantism.

During the third epoch three periods may be distinguished: I. The period of religious warfare, ending with the Peace of Westphalia, 1648. II. From 1648 to the French Revolution, the era of established Churches. III. Dawn to the present day: Neo-paganism in science and life, the age of unrestrained freedom to accept or deny the truths of religion.

Even while the Church was undergoing cruel persecution, she was also developing her discipline and defending her doctrines against the pagans and heretics. From the first three centuries have come down to us the valuable works of Ignatius, Polycarp, Justin, Clement of Alexandria, Origen, Tertullian, Cyprian, and many others. The mightier struggle with heresy, and her marvellous growth after she emerged from the catacombs, gave renown to Athanasius, Basil, the Gregories in the East and West, Chrysostom, the Cyrils, Hilary, Ambrose, Jerome, Augustine, Leo, and a host of other Christian writers, of whose works the modern world knows very little. The growth of monasticism (q.v.) is one of the glories of this age. Monks and nuns consecrated their lives to God's service by prayer and study and labor, thus preserving the ancient civilization from utter destruction by the barbarians, and preparing for the Church the means of converting these barbarians and transforming them into the

CATHOLIC CHURCH

civilized communities of Europe. The intimate union which existed between Church and State gave rise to the Holy Roman Empire (q.v.) and to the great body of laws by which their mutual relations were regulated. Frequent attempts were made later to subject the Church to the Empire. They were frustrated by the Popes, and especially by Gregory VII., after whom comes the glorious period of vigorous life and eminent learning. Among the orders that were then founded we may mention the Carthusians, Cistercians, Franciscans, Dominicans, and Servites, fruitful in numerous saints and scholars. The Church boasts of Saint Anselm, Peter Lombard, Albertus Magnus, Saint Thomas Aquinas, Saint Bonaventure, Duns Scotus, Saint Bernard, and others. It was also the age of Crusades (q.v.) for the recovery of Palestine. The 14th and 15th centuries are noted for the revival of interest in pagan literature, the sad exile of the Popes at Avignon, and frequent movements to effect a much-needed reformation of morals. In this work, many rejected the divine authority of the Church and were cast out as heretics; they are generally regarded as forerunners of Martin Luther (q.v.), who succeeded in separating whole sections of Germany from the Church, and became the occasion for the counter reformation that was effected by men like Francis de Sales, Ignatius Loyola, and Peter Canisius during the 16th century, and especially by the great work of the Council of Trent (1545-63). At this same period, millions of pagans were brought into the Church by the heroic labors of her missionaries, notably in South America, India, Ethiopia, and Japan. England, under Henry VIII. and Elizabeth, renounced the supremacy of the Pope, made a state religion of its own, and by the penal laws almost annihilated the Catholics. France remained Catholic, but, becoming infected with Jansenism and Gallicanism (qq.v.), and later with atheism and socialism, brought about the utter disorganization of Continental society. In the reconstitution of the shattered nations, Napoleon (q.v.) thought to make the Papacy his tool, and thus ruin the Church; but he failed, and the 19th century witnessed the gradual revival of the Church in almost all European countries, and its stupendous growth in the United States and other English-speaking countries. Catholic emancipation in England (1829), the Tractarian movement (see TRACTARIANISM) in the Established Church, that resulted in so many converts to Rome, and the restoration of the Catholic hierarchy (1850), have given Catholics prominence in English life. In France, though the people are loyally Catholic, the government is engaged in controversy with the Church and in the attempt to control Catholic education. When the French garrison was withdrawn from Rome in 1870, the Papal states and the city of Rome were annexed and added to the Italian kingdom. For the past 34 years the Pope has never left the Vatican Palace. Shorn of their earthly kingdom, Pope Pius IX. (q.v.) and Leo XIII. (q.v.) witnessed the attempt of Bismarck (q.v.), in Germany, to subject the Catholic Church to the State; but they witnessed also the failure of the attempt and the repeal of almost all the iniquitous laws. Persecution served only to unite all Catholics and revealed to them the power of united action. In the United States

the Church has grown from 244,500 in 1820 to 12,000,000 or 13,000,000 in 1900. This great increase has been due mainly to immigration from Europe and Canada. Irish, Germans, French Canadians, Italians, Poles, and Bohemians have come in large numbers. Meeting with no official opposition, the Church has prospered and is regarded even by many non-Catholics as a strong power for the preservation of the republic from the new social dangers that threaten the United States as well as the whole civilized world.

The activity of the Church in the mission field was almost destroyed by the wholesale confiscations of the French Revolution. As soon as order had been established in Europe, the missions revived, and, especially since Gregory XVI., have spread to every land of the world. Dioceses are mapped out and bishops appointed as soon as the circumstances warrant. The reorganization of the Congregation *De Propaganda Fide* by Pius IX., with separate sections for the Latin and the Oriental Churches, has been of great advantage. Colleges, institutes, and special religious congregations have been founded in various cities of Europe for work in the foreign missions. The Association for the Propagation of the Faith is the largest of the societies among the laity for the collection of funds. Missions are also conducted with success in the Oriental Churches in communion with the Holy See. These Churches hold the same doctrines as the Latin Church, but have special rites, discipline, and liturgical language. There are four chief groups: I. The Greek, subdivided into Greek proper, Melchite, Slav (which is Ruthenian and Bulgarian), and Rumanian. II. The Syrian, subdivided into Syrian proper, Syro-Chaldean (which also included the Malabar) and Maronite. III. The Coptic, which is Egyptian and Abyssinian or Ethiopian. IV. The Armenian. Pope Leo XIII. was much interested in these eastern churches, and had the joy of receiving many converts into communion. See MISSIONS, ROMAN CATHOLIC.

Statistics.—The number of Catholics throughout the world, according to the latest computations given by H. A. Krose, S.J., in the 'Stimmen aus Maria Laach,' July-August 1903 (republished in the 'Catholic World,' New York, February 1904), is 264,505,922. They are distributed as follows: Asia, 11,513,276; Africa, 3,004,563; Australia and Oceanica, 979,943; America, 71,350,879; Europe, 177,657,261. These numbers, according to the compiler, represent less than the whole number of Catholics, on account of the impossibility of obtaining official reports. He believes that there are at least 270 millions. For America the following numbers are given:

British North America, 2,301,693; United States, 10,976,757; Central America, 16,150,946; West Indies, 4,964,481; South America, 36,957,002; total, 71,350,879. In the Philippine Islands there are 6,599,998 Catholics. The number of Catholics assigned to the United States is regarded by the ecclesiastical authorities as too low; it is variously estimated at thirteen or fourteen millions. The following table gives the estimated number in the chief countries of Europe:

Austria Hungary, 35,570,870; Belgium, 6,660,000; Denmark, 5,373; France, 38,180,000; German Empire, 20,321,441; Great Britain, 2,-

CATHOLIC COLLEGES IN EUROPE — CATHOLIC EMANCIPATION ACT

000,000; Greece 34,710. Ireland 3,500,000. Italy, 32,300,000; Holland, 1,790,161; Norway, 1,969; Portugal, 5,277,000; Russia and Finland, 11,326,804; Sweden, 1,390; Switzerland, 1,383,135; Spain, 18,200,000; Turkey and Crete, 300,000.

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Catholic Colleges in Europe, American.

(1) The Pontifical College of the United States at Rome, Italy. This institution was founded by Pius IX., and was formally opened by him 8 Dec. 1859. In 1884 Leo XIII. ranked it among pontifical colleges, with the privileges thereto appertaining. Ecclesiastical students only are admitted; students pursuing the courses in the humanities, philosophy, and theology at the Urban College of the Propaganda. In 1904 the number of students was reported as 97. (2) The American College at Louvain, Belgium. This was founded in 1857 by several American bishops. The rules and constitutions were confirmed by Leo XIII. in 1895. The objects of the institution are to educate for the priesthood American students sent by their bishops to Louvain, and to prepare students from Belgium and adjacent countries for important missions in dioceses of America. Only those students are admitted who have finished a complete course in philosophy at a Catholic college. There is a three years' course in theology at the University of Louvain, followed by higher studies leading to the various degrees in theology and canon law.

Catholic Copts, those native Egyptian Christians, about 5,000 in number, who acknowledge the authority of the Pope. One of their priests was made a vicar apostolic and bishop *in partibus* (residence at Cairo) in 1855; in 1895 Leo XIII. established over them a hierarchy, the head of which has the designation "Patriarch of Alexandria of the Copts."

Catholic Creditor, in Scots law, a creditor whose debt is secured by a lien or charge on more than one subject belonging to the debtor.

Catholic Education. See EDUCATION, ROMAN CATHOLIC; CANADA — CATHOLIC EDUCATION.

Catholic Emancipation Act, an act of the British Parliament passed in the 10th year of the reign of George IV., 13 April 1829, by which the Catholics of Ireland were relieved of civil

disabilities still persisting there after the more odious and oppressive provisions of the penal laws enacted in 1691, in violation of the stipulations of the Treaty of Limerick, had been gradually done away. For 50 years after 1691 those laws were enforced vigorously; from that time to the era of emancipation there was a gradual relaxation. The design of those penal laws was the extermination of the Catholic religion in the island and the administration of the government purely for the behoof of the "Protestant interest" and the "English interest." A Catholic was not permitted to be a landowner, nor even to hold land on lease, save for a brief term; the son of a Catholic could, by making profession of the Protestant religion, come into possession of his father's property, allowing to his parent an annuity; if a Catholic owned a horse, whatever its value, any Protestant might legally seize it on paying to the owner \$25; no Catholic priest could lawfully exercise his ministry in Ireland save under severe restrictions, and monks and friars were regarded as felons and punished as such; no Catholic could be a barrister, nor a schoolmaster; Catholics were ineligible to the Parliament of Ireland, or even as electors; they were not permitted to be freemen of boroughs. When the act of union of the kingdom of Ireland with that of Great Britain was passed William Pitt gave solemn assurance to the Catholics of Ireland that the last of their disabilities would be forthwith removed, and bills to that effect were brought into Parliament; but Pitt, giving way before the insane bigotry of King George III., did not press the measure and went out of office. The Catholics continued to demand their enfranchisement and emancipation, and their appeals were heard in the British Parliament; but it was seen that the hope of redress of grievances was vain unless a show of force was made, or a popular agitation set on foot. Daniel O'Connell, already a highly successful counselor-at-law, though not a barrister, owing to his disability as a Catholic, took the leadership of the Catholics of Ireland, and from 1824 till the act of emancipation was passed, Ireland was the scene of an unprecedented popular agitation, never equaled in any country till the agitation for the repeal of the union with Great Britain was set on foot immediately after the grant of Catholic emancipation. The British cabinet was alarmed by the outburst of popular enthusiasm in Ireland, and the House of Commons in 1825 passed a relief bill for Ireland, but the lords rejected it. A second relief bill, two years later, failed in the House of Commons. But the following year, 1828, the House, although the cabinet (Wellington's) was adverse, passed that second bill. This gave the cabinet and even the king (George IV.) pause, and it was confessed that really something might or must be done; but the agitation must cease. The reply of the Irish Catholics was to nominate O'Connell, despite his legal disability, for membership in the Parliament and to elect him triumphantly. He was a member of Parliament-elect, but he would not take the oath whereby he must accept the king's supremacy in religion. It was the king and the cabinet that had to retreat now. The bill for Catholic emancipation was brought into the House of Commons on 5 March 1829, and passed the first reading by a

CATHOLIC EPISTLES — CATHOLIC INDIAN MISSIONS

majority of 188 in a House of 508 members; on the second reading the majority was 180; and on the final vote it was 178 in a House of 462. Even in the lords the measure was passed by a good majority, and the bill received the king's assent. The rights and privileges accorded to the Catholics of Ireland by this act were: that they were not to be required to take the oath of supremacy; that they became admissible to all offices in corporations and to enjoyment of all municipal rights. But no Catholic could be regent or lord chancellor, either of Great Britain or of Ireland; and they were incapable of holding offices connected with the Established Church or the universities. In all other respects the Catholics were to stand on an equal footing with Protestants.

Catholic Epistles, those letters in the New Testament which are addressed to the faithful in general, not to particular churches, as is that to the Philippians, that to the Ephesians, etc.; nor to individuals, as are the epistles of Paul to Timothy, Titus, etc. The catholic or general epistles are those of James, 1 and 2 Peter, 1 John, and the epistle of Jude. These same epistles are also styled Canonical, signifying, according to Calmet, that they contain excellent rules (*canones*) of faith and morals.

Catholic Indian Missions, Bureau of, an organization of the Roman Catholic Church, established in 1874 by the archbishop of Baltimore in behalf of Catholic prelates having Indian missions within their respective dioceses, in order to represent before the Government the interests of these prelates in all matters appertaining to Indian affairs. By decree of the 3d Plenary Council of Baltimore it was recognized as an institution of the Church and placed under the charge of a committee of seven prelates. This committee was dissolved in 1894; and the bureau, as then constituted was superseded by a new corporation. The chief work of the bureau is the establishment of schools among the Indian tribes, and obtaining funds for their maintenance. See INDIAN, EDUCATION OF THE.

Catholic Indian Missions of the United States (referring exclusively to actual missionary effort made within the present boundaries of the United States).

Early Period.—Although priests had visited the present territory of the United States previous to the advent into New Mexico of the Franciscan Friar Mark of Nice (1539), Catholic mission work properly dates from the expedition of Coronado the year following. Franciscan friars were the pioneers; it was chiefly they who evangelized the tribes of Florida, Texas, New Mexico, Arizona, and Upper California. Their exceedingly long roll of missionaries, many of them martyrs, contains such illustrious names as John of Padilla, the protomartyr of the United States missions (New Mexico, 1542), Francis Pareja (Florida, 1612), who published several treatises in Timuquanan, his 'Doctrina Christiana' being the first work in any Indian language of this country to issue from the press; Ven. Anthony Margil of Jesus (Texas, 1716); Junipero Serra (California, 1769-84). The Dominicans gave to Florida Luis Cancer, the martyr (1549), Dominic of the Annuciation, Salazar and others (1559). The Jesuits were pre-eminently the apostles of

the north, their missions extending from Maine to the Mississippi River. They also announced the Gospel in many other portions of the country. Among their best known missionaries were Martinez (Florida, 1566); Rogel (South Carolina, 1569); Kühn (Arizona, 1687); the illustrious martyr Jogues (New York, 1646); Chaumonot and Dablon (New York, 1654); Le Moyne (New York, 1661); Allouez (Wisconsin, 1670); Marquette (discoverer of the Upper Mississippi, 1673); Rale (Maine, 1724); Dupoisson (Natchez, 1729). Besides Franciscans and Jesuits, other priests engaged in the work, and Christianity was preached to the natives throughout the length and breadth of the land.

Results.—In many instances the missions flourished exceedingly; the Indians received a rudimentary education, and were brought to a high state of civilization. In 1630 there were in New Mexico about 35,000 Christian Indians, living in 90 pueblos, each pueblo having its church, attended from 25 mission residences. In 1634 there were in Florida 35 Franciscans maintaining 44 missions, while the Christian Indians numbered between 25,000 and 30,000. In California the results were equally satisfactory. The fruits of the labors of the early missionaries may still be seen among the Indians of New Mexico, Arizona, California, Minnesota, Wisconsin, Michigan, and Maine. The missionaries not only evangelized the Indians, but they have placed the whole world in their debt by their work of exploring and colonizing, and by their contributions to science. They wrote exhaustively on many topics, and, moreover, preserved to posterity the Indian languages by means of numerous lexicons, grammars, and books of devotion and instruction.

The Missions Revived.—In the last century the tribes of the great Northwest were evangelized principally by the modern apostle of the Indians, Peter John De Smet, S. J. (1838-73) and his Jesuit co-laborers. The Jesuits, moreover, established missions among the tribes of Alaska. Other noted missionaries of the period were the Benedictine monks, who have met with marked success, especially in Minnesota and the Dakotas; and Bishop Baraga (Michigan, 1830-68); Archbishop Blanchet (Oregon, 1838-80); Bishop Marty, O. S. B. (Dakota, 1876-94).

One of the results of President Grant's "Peace Policy" was the establishing, in 1874, at Washington, D. C., of the Bureau of Catholic Indian Missions, to represent Catholic Indian interests at the seat of government, to superintend Catholic agencies and to obtain other agencies falling by the terms of the peace policy to the Catholic Church. Upon the modification of the peace policy, the bureau turned its attention to the establishing of schools and the aiding of missions, and since the withdrawal of government aid from Indian mission schools, it provides financial support for such Catholic institutions. The history of the bureau since its inception is intimately bound up with that of the missions. It has established over 50 schools, which represent an investment of more than \$1,000,000. The name most prominent in Catholic Indian mission work of the present day is that of Mother M. Katharine Drexel, foundress of the Sisters of the Blessed Sacrament for Indians and Colored People, who has

CATHOLIC KNIGHTS OF AMERICA — CATHOLIC SEMINARIES

devoted her life and a very large fortune to mission work among the Indians and negroes.

Present Status.—The tribes wholly or partially Catholic are: Arickaree, Assinaboin, Abenaki, Blackfeet, Cœur d'Alene, Chippewa, Crow, Colville, Digger, Flathead, Gros Ventre, Huron, Kalapuya, Mohawk, Mandan, Menominee, Mission, Nez Percé, Osage, Ottawa, Pottawatomie, Piegan, Passamaquoddy, Pueblo, Papago, Pima, Quapaw, Sioux, St. Regis, Tinneh, Tulalip, Umatilla, Winnebago, Wenatchi, and Yakima. Catholics are also to be found among the Arapahos, Choctaws, Cherokees, Chickasaws, Creeks, Comanches, Cayugas, Miamis, Northern Cheyennes, Otos, Oneidas, Poncas, Peorias, Stockbridges, Sauk and Foxes, and Yumàs. Most of these tribes are provided with missions, while a number of others live in the vicinity of missions and fall under Catholic influence. Consequently Catholic Indian mission work is carried on in Alaska, Arizona, California, Indian Territory, Idaho, Kansas, Minnesota, Michigan, Maine, Montana, Mississippi, New Mexico, Nebraska, New York, North Dakota, Oregon, Oklahoma, South Dakota, Washington, Wisconsin, Wyoming. Elsewhere small remnants of tribes are cared for by the parochial clergy. Sixty secular priests and 92 priests of religious orders (of which the most prominent are the Jesuits, Franciscans, and Benedictines), aided by 107 catechists (69 Indian and 38 white), labor on the Indian missions. The total number of priests (109), teaching brothers (24), lay brothers (49), scholastics (10), sisters (384, representing 13 different sisterhoods), and secular teachers (55) engaged in Indian educational work is 631. There are 95 schools (boarding and day), with 6,050 pupils; 178 churches and chapels; and the value of church and school buildings is not less than \$1,500,000. The mission records of 1903 show 2,612 baptisms (480 adults, 2,132 infants), 462 Christian marriages, 770 Christian burials. Of a total Indian population of 263,233, about 100,000 are Catholics.

Consult: Shea, 'The Catholic Church in Colonial Days' (1886); and 'History of the Catholic Church in the United States—1844 to 1866' (1892); O'Gorman, 'A History of the Roman Catholic Church in the United States' (1895); Reports of Bureau of Catholic Indian Missions from 1874, especially Report for 1903-04; Report of Commissioner of Indian Affairs for 1903.

REV. WM. H. KETCHAM,

Director of the Bureau of Catholic Indian Missions, Washington, D. C.

Catholic Knights of America, a fraternal organization established in Kentucky in 1877. It was chartered in 1880. Its object is to unite fraternally all acceptable Roman Catholics of every profession, business, and occupation; to give all possible moral and material aid in its power to members of the organization, by holding instructive and scientific lectures, by encouraging each other in business, and by assisting each other to obtain employment, and to establish and maintain a benefit fund for the benefit of the families of the members. The benefit fund is distributed according to well-established insurance rules. The age limits for admission are from 18 to 45. At first men only could become members; but since about 1901, women

have been allowed admission on the same conditions as men, except the age limits for women are from 18 to 40. The executive power is vested in the Supreme Council (National) with headquarters in St. Louis, Mo.; the State councils, and the officers of the local branches. In 1903 there were 500 branches in the United States, with a membership of 30,000 and a reserve fund of \$600,000. Since its organization to 1903, there has been paid to beneficiaries \$13,000,000; but the material aid has been slight compared with the spiritual, moral, and intellectual benefit the organization has effected. This is the pioneer Roman Catholic fraternal organization in the United States.

Catholic Majesty, a title given by Pope Alexander VI. to the kings of Spain, in memory of the complete expulsion of the Moors from Spain in 1491 by Ferdinand of Aragon. But even before that time several Spanish kings are said to have borne this title.

Catholic Missionary Union, The, an organization of the Roman Catholic Church established "to procure the services of clergymen and laymen of the Roman Catholic Church to teach and preach as missionaries of their faith in the United States and in furtherance of religious opinion"; "to lease, take, hold, and purchase places, buildings and lands for such teaching and preaching"; to provide for the maintenance of the workers; to publish and distribute books, pamphlets, and other reading matter in connection with these efforts; and to aid archbishops, bishops and other church authorities in the United States to establish and conduct missions within their respective jurisdictions. Its practical activity takes the form of the collection of funds to enable bishops of the various dioceses to reserve diocesan priests for missions to non-Catholics within their various jurisdictions and to maintain such missionaries in their work. The Apostolic Mission House, on the grounds of the Catholic University, Washington, D. C., is the training-school for diocesan missionaries.

Catholic Seminaries. The name seminary is generally applied to institutions where candidates for the diocesan priesthood in the Catholic Church receive their spiritual and intellectual training. Preparatory departments (Petite Seminaire) are sometimes found in the same building, but the term is generally applied in the United States to those institutions which admit only those applicants who have completed the collegiate course.

Saint Mary's Seminary, Baltimore, Md., was the first American Catholic seminary. It was founded at the request of Bishop Carroll, who secured from Father Emery in 1791 four priests of the Society of Saint Sulpice, which had been established in Paris by Father Olier in 1642 for the express purpose of training young men for the priesthood. For many years it was the only institution of its kind in the United States, and consequently it supplied to the ranks of the clergy the vast majority of native trained priests. At present there are about 250 seminarians at Saint Mary's. In 1805 it was raised by the Maryland legislature to the rank of a university.

In Saint Charles Theological Seminary, Overbrook, Pa., the aspirants to the priesthood for the archdiocese of Philadelphia are trained.

CATHOLIC SUMMER SCHOOL—CATHOLIC TOTAL ABSTINENCE

In 1835 Bishop Kenrick placed five ecclesiastical students under the care of his brother, Rev. Peter Kenrick, in a little house on the corner of Fifth and Prune (now Locust Street), Philadelphia. This was the humble beginning of the present magnificent establishment. A preparatory department was begun in 1859 at Glen Riddle over which the present Bishop Shanahan of Harrisburg presided for nine years. This institution passed out of existence when, in 1871, the students to the number of 128 took possession of the present building at Overbrook, which had been erected by Bishop Wood. For the maintenance of this institution the Catholics of Philadelphia contribute annually about \$35,000. At present (1905) there are 104 seminarists at Overbrook, 14 professors, and a library of 25,000 volumes.

Saint Joseph's Seminary, the theological seminary for the archdiocese of New York, is located at Valentine Hill, near Dunwoodie, a station on the Putnam division of the N. Y. C. R.R., and within the city limits of Yonkers. It was founded by the late Archbishop Corrigan and constructed at a cost of nearly \$1,000,000. It was opened in September 1896 and placed under the direction of the Sulpitian Fathers. The full course of study comprises six years, two of which are devoted to philosophy, the remaining four to theology. The faculty comprises 12 regular professors and a few instructors, and the students (who are not admitted until they have completed a classical college course) number about 150, nearly all from the archdiocese of New York. This institution has taken the place of the old provincial seminary of Saint Joseph, at Troy, N. Y.

Mount Saint Mary's Theological Seminary, Emmetsburg, Md., was founded in 1808 by Rev. Mr. Du Bois during the episcopate of Bishop Carroll of Baltimore, and in the following year 16 young aspirants to holy orders were brought hither from Pigeon Hills, Pa. In 1810 the college had 40 pupils, and as a more commodious building had then been erected, the founder gave to Mrs. Seton the log house which thus became the cradle of the great community of the Sisters of Charity in the United States. United to the seminary is the college department, wherein regular classical and scientific studies are pursued. There are 16 regular professors, several assistant teachers and over 200 students.

Saint Paul Seminary, Groveland Park, Minn., together with the College of Saint Thomas, Merriam Park, was founded by Most Reverend John Ireland, the present archbishop of Saint Paul. They are the result of the generosity of Mr. J. J. Hill, president of the Northern Pacific R.R., are located within a few miles of the city, have maintained a high grade of scholarship from the beginning, and are directly affiliated with the Catholic University in Washington. At present there are 177 students and 14 professors in the seminary proper; in the college 368 students and 17 professors.

Niagara University (formerly Seminary of Our Lady of Angels), founded by Rev. John Lynch of the Congregation of the Mission, a community organized by Saint Vincent de Paul in France in 1625. Father Lynch, the first president, who afterward became the first Archbishop of Toronto, in 1856 opened an insti-

tution on the lake shore near Buffalo, but finding the place not quite suited for the purpose, he removed in 1857 to the present site on the New York bank of the Niagara River, about four miles north of the great cataract. The university owns 300 acres; numbers about 200 students, 60 of whom are in the seminary, and has a faculty of 20. Its library contains 13,000 volumes. The grounds and buildings have a value of over \$500,000. The institution was incorporated under the title of the College and Seminary of Our Lady of Angels by an act of the legislature of the State of New York in 1863, and in 1883 it was erected into a university with full powers and authority under the present title of Niagara University, by the regents of the State of New York.

Saint John's Ecclesiastical Seminary for the Boston archdiocese is located at Brighton, a charming suburb, and was placed by its founder, the present Archbishop Williams, under the direction of Sulpitian Fathers, assisted here, as in Baltimore and New York, by professors taken from the ranks of the diocesan clergy. In the two departments, philosophical and theological, there are 12 professors and 98 students.

In 1905 there are 83 seminaries in the United States, wherein 3,926 diocesan students and members of religious communities are trained for the priesthood. In Europe, two institutions are maintained by the American bishops for the training of American students, the American College in Rome, and another at Louvain.

Catholic Summer School of America, a school for higher education established by the Roman Catholics at Plattsburg, N. Y., on Lake Champlain. It was organized in 1892, and met at various places before the present site was decided upon. In 1893 the regents of the University of the State of New York granted a charter by which this school became a legal corporation, and was classified in the system of public instruction devoted to university extension. By this charter certain advantages are acquired by summer-school students who wish to prepare for the regents' or State examinations. The object of the school is to increase facilities for those who wish to pursue lines of study in various departments of knowledge. Opportunities for instruction are provided by lectures from eminent specialists. Courses are given in anthropology, history, literature, ethics, science, and religion. The school is beautifully located, and though not far from the principal summer hotel on Lake Champlain, has its own cottage accommodations, a club or casino for social reunions, its lecture halls, and local book store. The place is an ideal summer resort and attracts many friends of education, both Roman Catholic and Protestant.

Another summer school, the Columbian Catholic Summer School, assembled at Madison, Wis., in July 1898, with lecturers from Washington, D. C., and other centres of educational work. In 1901 it removed to Saint Paul, Minn., and adopted the name of the American Catholic Chautauqua.

Catholic Total Abstinence Union of America, a confederation of all the Catholic total abstinence organizations in this country. It believes that the virtue of temperance is a religious virtue, to be cultivated by religious

CATHOLIC UNIVERSITY OF AMERICA

methods. The membership, amounting in the year 1900 to 80,000, includes women's societies and juvenile organizations, as well as men's societies. While the union urges men to become total abstainers, it does not hold that drink is an evil in itself, or that the use of it is wrong, but that the use of it is for many the proximate occasion of sin; and that by such persons drink should be abandoned altogether. It does not assert that all goodness and virtue are in total abstinence, but it does hold that total abstinence is a powerful preventive of social disorder and sin. The office of the general secretary of the union is in the house of the Paulist Fathers in New York. The union publishes for circulation numerous pamphlets on the subject of total abstinence.

Catholic University of America, an educational institution founded for the purpose of affording an opportunity for pursuing higher studies in the most important branches under the guidance of the Roman Catholic Church. According to its constitutions, the courses of study must be of the highest possible grade; and the constitutions further declare that "the authorities of the university shall take care to confer with the directors of Catholic colleges and seminaries in our country so that all may labor unitedly to advance the education of Catholic youth. The clause in the constitutions concerning the 'higher studies' has been so interpreted that to-day the university is a purely post-graduate institution. Whether the bishops of the United States, who assembled in the second plenary council of Baltimore, contemplated this or not is open to question. It is certain, however, that in October 1866, they earnestly expressed the wish that there should be in the United States a university in which all branches of science, both sacred and profane, should be taught." The precise scope of the university or the time for its foundation were not then decided upon. The idea of a university of the highest class was formulated by the Right Reverend John Spalding, bishop of Peoria, on all appropriate occasions, and the effect of his discourses on public opinion had much to do with the contentment with which American Catholics received the announcement that the prelates of the United States had resolved, in November 1884, in the third plenary council, that a university should be founded. The offer of Miss Gwendoline Caldwell, now the Marquise Monstiers de Merinville, of \$300,000 was accepted. This gift was made for the purpose "of founding a grand theological seminary for the higher education of the clergy of the United States, said seminary to form the basis of a future Catholic university."

It was thought that Washington, not because it is the capital of the country, but because of the great educational advantages offered by its libraries, laboratories, etc., would be the logical site, and although other places were suggested, Washington, after mature consideration, was chosen in 1885 by the board of trustees. This decision was formally approved by the hierarchy on 7 Sept. 1887. The Middleton estate, near the Soldiers' Home—one of the most beautiful parts of the District of Columbia—was bought in the same year. In the following year, the Right Reverend John J. Keane, bishop of Richmond, now archbishop of Dubuque, was elected the first rector. In a letter, dated 20

Oct. 1885, the Holy Father, Leo XIII., had warmly approved of the project. Bishop Keane was sent to Rome, bearing all the important documents concerning the university, and, on 21 April it was incorporated under the laws of the District of Columbia. The corner-stone of Caldwell Hall—the school of sacred sciences—was laid on 4 May 1888, in the presence of the President of the United States, representatives of the foreign embassies and legations, and a large group of distinguished persons from all parts of the country. On 13 Nov. 1889, the School of Sacred Sciences—that department of theology and cognate studies for students who had made preparatory studies in the seminaries—was opened with solemn ceremonies. In all the epochs that marked the growth of the university, the interest, sympathy, zeal, and good judgment of its chancellor, Cardinal Gibbons, archbishop of Baltimore, were evident.

So far, while the basis for an ecclesiastical establishment existed, no provision had been made for laymen or for the founding of departments of learning not strictly included in the educational processes of priests. The Catholic hierarchy and the laity were united in desiring that some further provision should be made. The Reverend James McMahan, afterward as Monsignor McMahan, an honorary member of the papal household, a priest of the archdiocese of New York, offered to the university a gift of \$400,000. This donation was accepted by the board of trustees in 1891, and the corner-stone of McMahan Hall was laid on 27 April 1892. On 1 Oct. 1895, McMahan Hall was dedicated, and the schools of philosophy and social sciences, including law, were opened. On 24 March 1896, the school of the technological sciences was founded. The directors of the theological school, Caldwell Hall, saw the difficulties which a graduate student in a country where priests are so much in demand for active work would meet. The whole field of theology is so wide, and the time allotted comparatively so short, being two years for the licentiate and two more for the doctorate, that the student is expected to concentrate his work upon one major branch of theology. Minor branches may be taken by him in the school of theology, or one minor in the school of philosophy. The school of sacred sciences is divided into four groups—the biblical, the dogmatic, the moral, the historical. The faculty of philosophy, organized in 1895, contains within it the schools of philosophy, philosophy proper, based on the teaching of St. Thomas Aquinas; experimental psychology, etc.; letters, literature, philology, etc.; physical, biological, and social sciences. The degrees offered in the school of sacred sciences are the baccalaureate, the licentiate, the doctorate—S.T.B., S.T.L., S.T.D. The degrees in philosophy are Ph.M. and Ph.D. The faculty of law contains the school of law and jurisprudence, the school of social sciences having been transferred to the faculty of philosophy on 8 Feb. 1898. Under the board of the institution of technology is the school of the technological sciences.

In September 1896, Bishop Keane, the rector, was called to Rome, to receive later an appointment to the archbishopric of Dubuque. He was succeeded by the Very Reverend Dr. Conaty on 22 Nov. 1896. Having served the allotted term of six years, Bishop Conaty, during his term

CATHOLIC WINTER SCHOOL — CATALINE

titular bishop of Samos, was appointed bishop of Los Angeles, and in April 1903, the Right Reverend Monsignor Dennis J. O'Connell, who in the fall of 1902 had been appointed rector of the university, assumed his duties.

MAURICE FRANCIS EAGAN, LL.D.

Catholic Winter School, a school holding session in the winter months at New Orleans. The first session was held 16 February to 14 March 1896, and was very successful. New Orleans was chosen for its seat as one of the most catholic centres of American education, with Tulane University, the Howard Memorial Library, a fine system of public schools, and the record of French Catholic spiritual and intellectual activity extending through nearly two centuries. At the school popular education is naturally connected with religion; the sessions are opened with pontifical high mass in St. Louis Cathedral.

Catholic Women's Benevolent Legion, a fraternal and beneficial society, incorporated under the laws of the State of New York, 23 Aug. 1895. Age limits, 17 and 55. Branches have been established in nearly every State in the United States; membership, in 1903, 30,000. They have paid out to beneficiaries several thousand dollars, but keep well invested a safe reserve fund. Special efforts have been made to establish social and literary societies, and to promote the spiritual and temporal welfare of their members.

Catholic Young Men's National Union, an association for furtherance of Roman Catholic unity and the moral advancement of its members. The means relied on for accomplishing its object are: practical fulfillment by the individual members of the obligations imposed by their religion; fraternal union of all associations that aim in any way at the spiritual, intellectual, and moral improvement of Catholic young men, and the privilege assured to each member of being received as a guest by any society in the Union, or as a member by transfer. The third plenary council of the Roman Catholic Church of the United States, held at Baltimore, thus expresses approval of the union in its pastoral letter: "In order to acknowledge the great amount of good that the C. Y. M. N. U. has already accomplished . . . we cordially bless their aims and endeavors, and we recommend the union to all Roman Catholic young men."

Catiline (LUCIUS SERGIUS CATILINA), Roman statesman: b. about 108 B.C.; d. Pistoia 5 Jan. 62 B.C. Of patrician birth, but poor, he attached himself to the cause of Sulla, had some share in his success, and still more in his proscriptions. Murder, rapine, and conflagration were the first deeds and pleasures of his youth. He appears to have served in the army with reputation. Sallust, who has written the history of his conspiracy, describes him as having a constitution that could support hunger, cold, fatigue, and want of sleep, to almost any limit; with a spirit bold, cunning, fruitful in resources; lusting after the wealth of others, prodigal of his own; a man of fiery passions, but limited judgment. Such was his art, that, while poisoning the minds of the Roman youth, he gained the friendship and esteem of the severe Cato. Equally well qualified to deceive the good, to intimidate the weak, and to infuse his own

boldness into his associates, he evaded two accusations brought against him by Clodius for criminal intercourse with a vestal, and for monstrous extortions, of which he had been guilty while proconsul in Africa. A confederacy having been formed of many young men of high birth and daring character, who saw no other means of extricating themselves from their enormous debts than by obtaining the highest offices of the state, Catiline was placed at their head. This eminence he owed chiefly to his connection with the old soldiers of Sulla, by means of whom he kept in awe the towns near Rome, and even Rome itself. At the same time he numbered among his adherents not only the worst and lowest of the populace, but also many of the patricians and men of consular rank. Everything favored the audacious scheme. Pompey was pursuing the victories which Lucullus had prepared for him; and the latter was but a feeble supporter of the patriots in the senate, who wished him, but in vain, to put himself at their head. Crassus, who had delivered Italy from the gladiators, was now striving after power and riches, and countenanced the growing influence of Catiline as a means of his own aggrandizement. Cæsar, who was laboring to revive the party of Marius, spared Catiline, and perhaps even encouraged him. Only two Romans remained determined to uphold their falling country—Cato and Cicero; the latter of whom alone possessed the qualifications necessary for the task. The conspirators were now planning the elevation of Catiline and one of his accomplices to the consulship, by which they hoped to obtain possession of the public treasures and the property of the citizens under various pretexts, and especially by means of proscription. Cicero had the courage to stand candidate for the consulship: neither insults nor threats, nor even riots and attempts to assassinate him, deterred him from his purpose; and being supported by the rich citizens, he gained his election, 65 B.C. All that the party of Catiline could accomplish was the election of Antonius, one of their accomplices, as colleague of Cicero. This failure, however, did not deprive Catiline of the hope of gaining the consulship the following year. For this purpose he revived the kind of terrorism by which he had laid the foundation of his power. Meanwhile, he had lost some of the most important members of his conspiracy. Antony had been prevailed upon or compelled by Cicero to remain neutral. Cæsar and Crassus had resolved to do the same. Piso had been killed in Spain. Italy, however, was destitute of troops. The veterans of Sulla only waited the signal to take up arms. The signal was now given by Catiline. The centurion Manlius appeared among them, and formed a camp in Etruria. Cicero was on the watch: a fortunate accident disclosed to him the counsels of the conspirators. One of them, Curius, was on intimate terms with a woman of doubtful reputation, Fulvia by name, and had acquainted her with their plans. Through this woman Cicero learned that L. Vargunteius, a senator, and C. Cornelius, a knight, had undertaken to assassinate him at his house. On the day which they had fixed for the execution of their plan, they found the doors barred and guarded. Still Cicero delayed to make public the circumstances of a conspiracy, the progress and resources of which

he wished first to ascertain. He contented himself with warning his fellow citizens, in general terms, of the impending danger. But when the insurrection of Manlius was made known, he obtained from the senate the decree, only promulgated on occasions of the utmost importance, that "the consuls should take care that the republic receive no detriment." It was exceedingly difficult to seize the person of one who had soldiers at his command both in and out of Rome; still more difficult would it be to prove his guilt before judges who were accomplices with him, or at least were willing to make use of his plans to serve their own interest. Cicero had to choose between two evils — a revolution within the city, or a civil war: he preferred the latter. Catiline had the boldness to take his seat in the senate, known as he was to be the enemy of the Roman state. Cicero then rose and delivered that bold oration against him, beginning, *Quousque tandem abutere, Catilina, patientia nostra?* ("How long then, Catiline, wilt thou abuse our patience?") Assuming a confidence he did not possess, he attempted a reply, but his words were instantly drowned by the cries of "Parricide!" and "Traitor!" which rose on all hands. Now fully conscious that his plans were discovered, he rushed from the assembly with threats and curses on his lips, and left Rome at dead of night. The conspirators who remained, Lentulus Sura, Cethegus, and other infamous senators, engaged to head the insurrection in Rome as soon as Catiline appeared at the gates. According to Cicero and Sallust, it was the intention of the conspirators to set the city on fire, and massacre the inhabitants. Lentulus, Cethegus, and the other conspirators, in the meanwhile, were carrying on their criminal plots. They applied to the ambassadors of the Allobroges to transfer the war to the frontiers of Italy itself. These, however, revealed the plot, and their disclosures led to others still more important. The correspondence of the conspirators with their leader was intercepted. As the circumstances of the case did not allow of a minute observance of forms in the proceedings against the conspirators, the laws relating thereto were disregarded, as had been done in former instances of less pressing danger. Cæsar spoke against immediate execution, but Cicero and Cato prevailed. Five of the conspirators were put to death. Caius Antonius was then appointed to march against Catiline, but on the pretext of ill health, gave the command to his lieutenant, Petreius. He succeeded in enclosing Catiline, who, seeing no way of escape, resolved to die sword in hand. His followers imitated his example. The battle was fought with bitter desperation. The insurgents all fell on the spot which their leader had assigned them, and Catiline at their head. See Sallust, 'Bellum Catilinarium'; Cicero, 'Orationes in Catilinam'; Rose, 'History of Catiline's Conspiracy' (1813).

Catinat, Nicholas de, Marshal of France: b. Paris 1637; d. Saint Gratien 1712. He quitted the profession of the law for that of arms, and attracted the notice of Louis XIV. at the storming of Lille in 1667, and was promoted. By a number of splendid deeds he gained the esteem and friendship of the great Condé, particularly by his conduct at the battle of Senef. He was sent as lieutenant-general against the Duke of Savoy, gained the battles

of Staffardo, 18 Aug. 1690, and of Marsaglia, 4 Oct. 1693, occupied Savoy and part of Piedmont, and was made marshal in 1693. In the conquered countries his humanity and mildness often led him to spare the vanquished, contrary to the express commands of Louvois. In Flanders he displayed the same activity, and took Ath in 1697. In 1701 he received the command of the army of Italy against Prince Eugene; but was straitened by the orders of his court, and was destitute of money and provisions, while Eugene was allowed to act with full liberty. On 6th July he was defeated at Carpi. Equally unfortunate was the battle of Chiari, where Villeroi had the chief command. It was here, while rallying his troops after an unsuccessful charge, that he replied to an officer who represented to him that death was inevitable in such an encounter, "True, death is before us, but shame behind." In spite of his representations the French court would not believe the disasters in Savoy to be owing to the perfidy of the Duke of Savoy, and Catinat was disgraced. He was a true philosopher, religious without austerity, a courtier without intrigue, disinterested and generous when in favor and cheerful in disgrace. From his unalterable calmness and consideration his soldiers called him "le Père la Pensée."

Catineau-Laroche, Pierre Marie Sebastien, pē-ār mā-rē sâ-bās-tī-ōñ kâ-tē-nō lā-rōsh, French lexicographer: b. Saint-Brieux, 25 March 1772; d. 22 May 1828. He studied at Poitiers, and emigrated to St. Domingo, where he published a journal ('L'ami de la paix et de l'union.') He was sentenced to death for the opinions which he advocated, but, by the timely assistance of the agents of the king of France, succeeded in escaping to Cape Haytien (then called Cape Français), where he alone of 17 of his countrymen was saved from the subsequent massacre in that city. He now visited the United States and England, and on his return to Paris, in 1797, prepared several dictionaries. His printing office having been destroyed by fire, the government employed him in various public capacities. Once more he visited the United States, and on his return, in 1819, he was commissioned to go to Guiana, and study the climate and resources of that province. His notes on that country appeared in 1822.

Cat'lin, George, American traveler and artist: b. Wilkesbarre, Pa., 26 June 1796; d. Jersey City, N. J., 23 Dec. 1872. After practising as a lawyer for two years he set up at Philadelphia as a portrait painter, and in 1832 commenced special studies of the American Indians, residing many years among them both in North and South America. In 1840 he went to Europe, and subsequently introduced three parties of American Indians to European courts. His finely illustrated works are: 'Manners, Customs, and Condition of the North American Indians' (1857); 'North American Portfolio' (1844); 'Eight Years' Travel in Europe' (1848); 'Last Rambles Among the Indians,' etc. (1868). His 500 portraits from life of American Indians are now in the National Museum at Washington, D. C., constituting what is known as the "Catlin Gallery."

Catlin, Henry Guy, American mining engineer: b. Burlington, Vt., 21 July 1843. He studied at the University of Vermont, and

CATLIN — CATO

served during the Civil War in the 12th Vermont Volunteers. Besides various contributions to the magazines, descriptive of western life, he has written 'Yellow Pine Basin' (1898).

Catlin, Louise Ensign, American writer: b. Lockport, N. Y., 9 May 1861. She was educated at Smith College, and was married to Frederick Ward Catlin in 1882. She has published 'Marjory and Her Neighbors.'

Catlinite, a dull red indurated clay. It occurs in Pipestone County, Minn., as a layer about 18 inches thick in quartzite. It has been extensively manufactured by the Sioux Indians into pipes and various ornamental objects.

Cat'nip, Cat'nep, or Cat-mint, a hardy perennial herb (*Nepeta cataria*) of the natural order *Labiatae*. It is a native of the Orient and Europe, and has become distributed in most temperate regions of the globe. It is very common in America in the neighborhood of dwellings. Cats are especially fond of it, rubbing themselves upon it and eating it with evident relish. Like other members of its order, it contains a fragrant volatile oil, for which it is sometimes used in cooking. It grows about two feet tall, bears heart-shaped, velvety, whitish-green leaves, and dense whorls of numerous small, purplish or rosy-white flowers. Catnip is sometimes planted in herbaceous borders to soften the tinting, at the same time heightening the effect with its erect stems. In medicine, catnip tea enjoys great popularity with the laity. It is brewed hot and is very useful in attempts to avert "colds." The heat, volatile oil, and accompanying care that the patient takes are all self-conservative.

Cato, Dionysius, the reputed author of the small collection of moral apophthegms known as 'Catonis Disticha de Moribus ad Filium.' Nothing is known of him; but the work, which is apparently in large part a genuine classic, had a high reputation in the Middle Ages.

Cato, Marcus Porcius, THE CENSOR, surnamed PRISCUS, also SAPIENS ("the wise"), and MAJOR ("the elder"), Roman statesman and general: b. Tusculum 234 B.C.; d. 149 B.C. He inherited from his father, a plebeian, a small estate in the territory of the Sabines, which he cultivated with his own hands. He was a youth at the time of Hannibal's invasion of Italy, and served his first campaign, at the age of 17, under Fabius Maximus, when he besieged Capua. Five years after he fought under the same commander at the siege of Tarentum. After the capture of this city he became acquainted with the Pythagorean, Nearchus, who initiated him into the sublime doctrines of his philosophy, with which, in practice, he was already conversant. After the war was ended Cato returned to his farm. As he was versed in the laws, and a fluent speaker, he went at daybreak to the neighboring towns, and acted as counselor and advocate to those who applied to him. Valerius Flaccus, a noble and powerful Roman, who had an estate in the vicinity, observed the talents and virtue of the youth, conceived an affection for him, and persuaded him to remove to Rome, where he promised to assist him with his influence and patronage. A few rich and high-born families then stood at the head of the republic. Cato was poor and unknown;

but his eloquence, which some compared to that of Demosthenes, and the integrity and strength of his character, soon drew public attention to him. At the age of 30 he went as military tribune to Sicily. In the following year he was quæstor, at which period there began between him and Scipio a rivalry and hatred which lasted till death. Cato, who had returned to Rome, accused Scipio of extravagance; and, although his rival was acquitted, this zeal in the cause of the public gave Cato a great influence over the people. Five years after, having been already ædile, he was chosen prætor, and obtained the province of Sardinia. His strict moderation, integrity, and love of justice, were here still more strongly displayed than in Rome. On this island he formed an acquaintance with the poet Ennius, of whom he learned Greek, and whom he took with him to Rome on his return. He was made consul 192 B.C., having his friend Valerius Flaccus for colleague. He opposed with all his power the abolition of the Oppian law, passed in the pressing times of the second Punic war, forbidding the Roman women to wear more than half an ounce of gold, to dress in garments of various colors, or to wear other ornaments; but he was obliged to yield to the eloquence of the tribune Valerius, and still more potent female importunities. Soon after, he set out for Spain, which was in a state of rebellion. His first act was to send back to Rome the supplies provided for the army, declaring that the war ought to support the soldiers. He gained several victories with a newly raised army, reduced the province to submission, and returned to Italy, where the honor of a triumph was granted to him. He afterward put himself under the command of the Consul Manius Acilius, to fight against Antiochus, and to carry on the war in Thessaly. By a bold march he made himself master of the Callidromus, one of the highest peaks of the mountain pass of Thermopylæ, and thus decided the issue of the battle. He brought the intelligence of this victory to Rome, 189 B.C. Five years after, in spite of a powerful faction opposed to him, he obtained the most honorable, and at the same time the most feared, of all the magistracies of Rome, the censorship. He had not canvassed for the office, but had only expressed his willingness to fill it. In compliance with his wishes Valerius Flaccus was chosen his colleague, as the only person qualified to assist him in correcting the public disorders, and restoring the ancient purity of morals. He fulfilled this trust with inflexible rigor; and though his measures brought him some obloquy and opposition, they met, in the end, with the highest applause; and when he resigned his office, it was resolved to erect a statue to him with an honorable inscription. He appears to have been quite indifferent to the honor; and when, before this, some one expressed his wonder that no statue had been erected to him, he answered, "I would rather have it asked why no image has been erected to Cato than why one has." Still he was not void of self-complacency. "Is he a Cato, then?" he was accustomed to say, when he would excuse the errors of another. Cato's political life was a continued warfare. He was continually accusing, and was himself accused with animosity, but was always acquitted. His last public commission was an embassy to Carthage to settle the dispute between the Carthagin-

CATO

ians and King Massinissa. It is said that this journey was the original cause of the destruction of Carthage; for Cato was so astonished at the rapid recovery of this city from its losses, that he ever after ended every speech of his with the well-known words, *Præterea censeo, Carthaginem esse delendam* ("I am also of opinion that Carthage must be destroyed"). He died a year after his return. Cato, who was so frugal of the public revenues, was not indifferent to riches. He was rigorously severe toward his slaves, and considered them quite in the light of property. He made every exertion to promote and improve agriculture. He was twice married, and had a son by each of his wives. His conduct as a husband and a father was equally exemplary. He composed a multitude of works, of which the only one extant is 'De Agricultura.' Those of which the loss is most to be regretted are his orations, which Cicero mentions in terms of the highest encomium, and his history of the origin of the Roman people, which is frequently quoted by the old historians.

Ca'to, Marcus Porcius, called (to distinguish him from the censor, his great grandfather) CATO OF UTICA, Roman patriot: b. Rome 95 B.C.; d. Utica, North Africa, 46 B.C. He formed an intimacy with the Stoic Antipater of Tyre, and maintained through life the principles of the Stoic philosophy. His first appearance in public was against the tribunes of the people, who wished to pull down a basilica erected by the censor, Cato, which was in their way. On this occasion he displayed that powerful eloquence which afterward rendered him so formidable, and won the cause. He served his first campaign as a volunteer in the war against Spartacus, and highly distinguished himself. He served as military tribune in Macedonia in 67 B.C. When his term expired he went to Asia, and brought back the Stoic Athenodorus with him to Rome. He was made quæstor in 65 B.C., and executed his difficult trust with the strictest integrity, while he had the spirit to prosecute the public officers for their acts of extortion and violence. His conduct gained him the admiration and love of the Romans, so that, on the last day of his quæstorship, he was escorted to his house by the whole assembly of the people. The fame of his virtue spread far and wide. In the games of Flora the dancing-girls were not allowed to lay aside their garments as long as Cato was present. The troubles of the state did not permit him to remain in seclusion. The example of Sulla in usurping supreme power was followed by many ambitious men, whose mutual dissensions were all that saved the tottering constitution from immediate ruin. Crassus hoped to purchase the sovereignty with his gold; Pompey expected that it would be voluntarily conferred upon him; and Cæsar united himself to both and made use of the wealth of the one and the reputation of the other to attain his own objects. By keeping aloof from all parties Cato served the commonwealth with sagacity and courage; but he often injured the cause which he was trying to benefit by the inflexibility of his character. In 63 B.C. he was chosen tribune of the people. About this time the conspiracy of Catiline broke out. Cato supported Cicero, then consul, with all his power, first gave him publicly the name of "father of his country," and

urged, in a fine speech preserved by Sallust, the rigorous punishment of the traitors. He opposed the proposition of Metellus Nepos to recall Pompey from Asia, and give him the command against Catiline, and very nearly lost his life in a riot excited against him on this account by his colleague and Cæsar. After the return of Pompey he frustrated many of his ambitious plans, and first predicted the consequences of his union with Crassus and Cæsar. The triumvirate, in order to remove him to a distance, had him sent to Cyprus, of which he took possession on behalf of Rome (58-57). Compelled to obey, he executed his commission with so much address that he enriched the treasury with a larger sum than had ever been deposited in it by any private man. In the meantime he continued his opposition to the triumvirate. Endeavoring to prevent the passage of the Tribonian law, for investing the triumvirs with extraordinary powers, he was drawn into tumults, and even personal conflict. Being made prætor in 54 B.C., he carried into execution a law against bribery that displeased all parties. After the death of Crassus the civil commotions increased, and Cato, as the only means of preventing greater evils, proposed that Pompey should be made sole consul, contrary to the constitution, which proposition was adopted. The year following, 51 B.C., Cato lost the consulship by refusing to employ bribery to procure a majority. In 49 B.C. the civil war broke out. Cato, then proprætor in Sicily, on the arrival of Curio with three of Cæsar's legions, departed for the camp of Pompey at Dyrrachium. He had always hoped to prevent the war by negotiation; and when it broke out he put on mourning in token of his grief. Pompey, having been victorious at Dyrrachium, left Cato behind to guard the military chest and magazine, while he pushed after his rival. For this reason Cato was not present at the battle of Pharsalia, after which he sailed with his troops to Cyrene, Africa. Here he learned that Pompey's father-in-law, Scipio Metellus, had gone to Juba, king of Mauritania, where Varus had collected a considerable force. Cato immediately set off to join him, and after undergoing every hardship, reached Utica, where the two armies effected a junction, 47 B.C. The soldiers wished him to be their general, but he gave this office to Scipio, and took command in Utica, while Scipio and Labienus marched out against Cæsar. Cato had advised them to protract the war, but they ventured an engagement, in which they were defeated, and Africa submitted to the victor. Cato had at first determined to defend himself to the last, with the senators in the place; but abandoned this plan, and despairing of the commonwealth, and unwilling to live under the despotism of Cæsar, resolved to die. On the evening before the day which he had fixed upon for executing his resolution, he took a tranquil meal, and discussed various philosophical subjects. He then retired to his chamber and read the 'Phædo' of Plato. Anticipating his intentions, his friends had taken away his sword. He sent for it, and in spite of the tears and entreaties of his friends persisted in his purpose, advised those present to submit to Cæsar, and dismissed all but the philosophers Demetrius and Apollonius, whom he asked if they knew any way by which he could continue to live without being false to his principles.

Weeping silently, they left him. He then received his sword joyfully, again read 'Phædo,' made calm inquiries for departing friends, slept awhile, and when left alone stabbed himself. His people rushed in, and finding him in a swoon bound up his wounds; but, on coming to himself, he tore off the bandages and expired. The Uticans buried him honorably, and erected a statue to him. Cæsar, when he heard the news of his death, exclaimed, "I grudge thee thy death, since thou hast grudged me the honor of sparing thy life."

Cato, the title of two noted 18th century plays: (1) A blank verse tragedy by Joseph Addison in five acts. It was first represented in 1713. The scene is laid in a hall of the governor's palace at Utica. The subject is Cato's last desperate struggle against Cæsar, and his determination to die rather than survive his country's freedom. 'Cato' owed its extraordinary success to the deadly hatred that raged between the Whigs and Tories at the time: the Whigs cheered when an actor mentioned the word "liberty"; and the Tories, resenting the implied innuendo, cheered louder than they. To the Whigs Marlborough was a Cato, to the Tories he was a Cæsar. Every poet of the time wrote verses in honor of 'Cato,' the best being Pope's prologue; and it was translated into French, German, and Italian. (2) A tragedy by Metastasio, 1727. The author follows closely the historic accounts of Cato's relations with Cæsar, and the details have more probability than those of Addison. He shows a decided superiority to Addison in making Cæsar the principal figure next to Cato, and placing them constantly in contrast with each other.

Cato Street Conspiracy, or Thistlewood Conspiracy, in English history, a plot formed in 1820 to murder the foreign secretary, Lord Castlereagh and other cabinet ministers, and to form a provisional government. The leader of the conspirators was Arthur Thistlewood. The plot was discovered and several of the conspirators captured, on 23 February, when they had assembled in a stable on Cato Street and were preparing to carry out their intentions. Thistlewood, who escaped, was arrested the next day. After a trial in which they were defended by John Adolphus, Thistlewood and four others were executed, and five were transported.

Ca'ton, John Dean, American lawyer and author: b. Monroe, N. Y., 1812; d. 1895. From 1855 to 1864 he was chief justice of Illinois. He published 'A Summer in Norway' (1875); 'The Last of the Illinois and a Sketch of the Potawatonnies' (1876); 'The Antelope and Deer of America' (1877).

Catop'trics, that branch of optics which explains the properties of incident and reflected light, and particularly that which is reflected from mirrors or polished surfaces. The whole doctrine of catoptrics rests on the principle that the angle of incidence is equal to the angle of reflection and in the same plane.

Catop'tromancy, a species of divination practised by the Greeks, in which a mirror was let down by a cord into a fountain in the temple of Ceres, in Achaia, into which sick persons looked. If the observer's face appeared in it sickly or ghastly the omen was considered unfavorable, and the sick person would not re-

cover; but if, on the other hand, it appeared fresh and healthy, the omen was considered favorable.

Catorce, kä-tör'thā, or ka-tôr'sā, Mexico, a mining town of San Luis Potosi, which received its name, signifying 14, from a gang of robbers, formerly a constant menace to its inhabitants. It contains valuable silver mines, now pretty well worked out. The ore is mixed with sulphur, and requires treatment by a high degree of heat. When the French invaded Mexico, a mint was started here, and worked until 1867. The amount coined was about \$52,000,000. The population is variable, ranging from 10,000 to 18,000, according to the state of mining.

Catostom'idæ, a family of fishes of the order *Plectospondyli* (q.v.), or, in a more limited sense, of the *Eventognathi*. They have the first four vertebræ coalesced and partly converted into a chain of bones reaching from the swim-bladder to the internal ear; the lower pharyngeal bones elongated and falcate, and bearing a row of numerous comb-like teeth; the jaws toothless and formed in part by the maxillary bone; the mouth usually small with thick protractile lips; the form more or less elongate and rounded or slightly compressed; and the fins soft, rayed with no adipose (rayless) dorsal fin. An extensive family of fresh-water fishes, chiefly of North America, where 12 or 14 genera and more than 60 species occur; in addition to which a very few are found in eastern Asia. Although abundant almost everywhere in the United States, none of the species have more than a local value as food fishes. To the *Catostomidæ* belong the suckers, buffalo-fishes, horse-fishes, certain so-called mullets, etc. (qq.v.).

Cat'rail (also known as the PICTS' WORK or PICTS' WORK DITCH), the name applied to the remains of a large earthwork in Scotland, about 50 miles in length, which, beginning at Torwoodlee Hill, near the junction of the Gala Water with the Tweed, runs with a semicircular sweep southward through the counties of Selkirk and Roxburgh to a point under Peel Fell, in the Cheviots. The earthwork consisted of a deep ditch, with a rampart on each side, and varied in breadth from 20 to 26 feet. Various causes have resulted in the destruction of the ramparts in many places. The Catrail has led to much speculation.

Cats, Jacob, yä'kōb käts, Dutch poet: b. Brouwershaven, Zealand, 10 Nov. 1577; d. Zorgvliet, near Scheveningen, 12 Sept. 1660. He studied at Leyden, Orleans, and Paris. In 1627 and 1631 he was ambassador to England, and in 1636 grand pensioner of Holland. His poetry is unimaginative, and didactic, but has been extremely popular with the Dutch middle class by whom he is frequently affectionately alluded to as "Father Cats." His works consist of allegories, according to the taste of his times, poems on the different ages and situations of life, idyls, etc. Among the most noted are 'Het Houwelijk' (Marriage) (1625); 'Sinnen Minnebeelden' (1618); 'Trouringh' (1637).

Cat's-eye, the name given to several hard semi-transparent stones used as gems, which, when cut in a certain way, show a line of light giving what is called a *chatoyant* effect. The true cat's-eye is a chrysoberyl of a greenish color, found in Ceylon and Brazil. The line of

CATSKILL — CATSKILL MOUNTAINS

light shown when the stone is cut *en cabochon* is due to the structure of the crystal, or to included impurities. The common cat's-eye, of little value, is a crystalline quartz sometimes containing fibres of asbestos, which, cut across the fibres, gives a *chatoyant* effect. It is found in Bavaria. Tiger-eye (q.v.) also shows the chatoyancy of the cat's-eye. Beautiful tourmaline cat's-eyes, rivaling the oriental stones, have recently been found in California. Stones exhibiting the cat's-eye ray have been cut from various other minerals, including beryl, corundum, fibrous hornblende, bronzite, and hypersthene.

Cats'kill, N. Y., village and county-seat of Greene County, 30 miles southeast of Albany, on the west side of the Hudson River and on the West Shore and the Catskill Mountain R.R.'s; also connected with the New York Central by a ferry crossing the Hudson. It is a noted mountain summer resort and has a courthouse, opera house, free academy, two national banks, several public schools, weekly newspapers, manufactories, and hotels. Pop. (1900) 5,484.

Catskill Group, a name given to a great thickness of red, brown, green, and gray conglomerates, sandstones, and shales of which the Catskill Mountains are composed. Being well exposed by numerous cliffs and gorges, these deposits were carefully studied by the New York Geological Survey some 50 years ago. The rocks were believed to constitute a series, having a definite place in the classification of the Palæozoic rocks worked out by the Survey, and were given the name Catskill. Subsequent investigation has shown that the Catskill is not even to be called a group. It is simply a succession of shoal-water deposits of Upper Devonian age, that were laid down along one shore of an interior sea, while normal marine sediments, now represented by limestones, were being laid down elsewhere. Thus it happens that the Lower Catskill, of the Catskill Mountains, is represented elsewhere by limestones of the Hamilton stage, the Middle Catskill by the Portage, and the Upper Catskill by the Chemung. In the Catskill Mountains the so-called Catskill series is 4,500 feet thick; and where thickest, at Mauch Chunk, Pa., it is 7,500 feet thick. Farther south the rocks thin out and disappear altogether in Virginia. Though having no standing as a rock group, the Catskill is of interest from its many resemblances to the Old Red Sandstone of England, made famous by Hugh Miller, and is of economic importance from containing some beds of excellent flags, quarried at numerous openings in Ulster, Greene, and Delaware counties, N. Y., and sold as Hudson River bluestone. See DEVONIAN; OLD RED SANDSTONE.

Catskill Mountains. In the eastern part of the State of New York, facing the valley of the Hudson River, appears a group of mountains so singular in their formation, so exceptional in point of beauty of outline, that they have attracted universal attention since the day when the astonished crew of the Half Moon first saw their peaks rise above the primeval forests that lined the shores of the great river.

That part of the earth's surface now called New York is very old; so old, indeed, that it is difficult to guess at the age of the first rocky

islands that appeared above the ancient seas. The Highlands of the Hudson and the plateau of the Adirondacks may be among the oldest lands in the world. The interior of the State remained under the inland sea, that spread from the Hudson valley westward to the present Great Lakes for perhaps millions of years after these primal islands appeared. In time the surf, the rain, and the ice tore down these islands and spread the resulting sand, gravel, and mud far and wide over the sea floor, and in the course of ages filled up this inland sea so that it ultimately became dry land. This fact makes the interior of the State one of the most remarkable places in the world, for here the history of the earth is spread open as a page wherein can be easily read the progress of world-building. Fortunately the floor of the old sea has much of it remained undisturbed so that many successive pages can be seen in their original positions.

Men of science have divided the age of the earth's crust into four great "times," each an unknown number of millions of years long. The first is Eozoic Time, the pale, dim dawn-time before there was any life or before the first faint traces of the lowest life appeared. The second is Palæozoic Time, and this grand period is divided for convenience into three shorter "ages." The third is Mesozoic Time, also divided into three "ages"; and the last, in which we live, is Cenozoic Time. Looking far back to the beginning of the third age of Palæozoic Time we can imagine the southern and western border of the State a vast stretch of sandy bars, awash or in the sea, vaster wastes of soft mud and oozy shoals of limey remains of marine life, great pebbly beaches and shingly bays and countless islands in the great muddy sea. The waters swarmed with fish, for the age of fishes was already old, and on the land already appeared the land plants, for the age of land plants was just beginning. To the south were vast tropic, fern-clad swamps that were to be turned later into the coal fields of Pennsylvania. To the north the far older parts of the State were perhaps already dry land or rapidly becoming so. Then, later, we do not know when, this vast track of half sea, half land, slowly turned to sandstones, shales, and slates. Still later, under the tremendous pressure caused by the gradual shrinkage of the earth's crust, it was pushed up into the air, and it now forms the great flat dome or plateau that extends along the southern edge of the State next the Pennsylvania line. Out of this interior upland, that slopes gently to the north, was thrust toward the east a narrow tongue of pale-blue shale or slate-like stone and gray and red sandstones that intruded upon the valley of the Hudson. The disturbance caused by the shrinkage of the earth was far more violent in the eastern part of the State than in the western part, as plainly shown by the present distorted positions of the water-formed rocks in the Hudson valley, and this tongue of newer stone was lifted high in the air. The upward pressure lifted the entire mass into the air perhaps without breaking it and leaving it slightly tilted downward or inclined to the west, a vast, wonderful plateau, a giant-wall of rocks unique among the stony annals of the world. To-day we look upon it in mingled wonder at such a page of world-history and admiration at the handiwork of the rain that has made of such a story-book so great a gal-

CATSKILL SCENERY.



BIG INDIAN VALLEY.



ENTRANCE TO THE PLAATERSKILL CLOVE.

CATSKILL MOUNTAINS

lery of pictures. We call this open page of the earth's story "the Catskills."

The beauty of every landscape depends upon its point of view. A hill that seems commonplace from one side may have unusual grace and refinement when seen from another side. Herein lies the charm of the Catskills—they are fine from every side. Thrust forward into the comparatively level Hudson valley, they seem to stand quite alone between the Laurentian and far older mountains of the Highlands and the Adirondacks. The traveler approaching by boat or by rail on the eastern shore and from the south is surprised soon after leaving Poughkeepsie by sudden, blue elusive glimpses of dim forms, half cloudlike, upon the northern horizon. Then, for more than an hour, by rail, the mountains pass in grand procession, presenting at every mile new charms of peak and slope. In clear weather and, particularly in winter, the banded or stratified appearance of the eastern face of the range is readily seen, showing plainly that the Catskills are rocks laid down in the ancient sea. Moreover, those mile-long bands mark the ends of the stratifications, sharply broken off and making a remarkable wall or face, unlike the usual slope of other mountains, like the Adirondacks or the Highlands. The views from the West Shore Railroad are equally interesting, and are nearer and more neighborly. The approach from the north, by rail or boat, is also interesting, though it shows the grand panorama of peaks in a reversed order.

There are three routes by which the more settled or summer resort portion of the Catskills may be reached. Beginning at Rondout or Kingston, for the two towns are one, the Ulster & Delaware Railroad enters the Catskills by their southern gateway. Kingston can be reached by the West Shore Railroad or by boat, or by the New York Central Railroad at Rhinebeck and then by ferry to Kingston. On leaving Kingston the first foot hills soon appear, and at every mile the scenery becomes more wild, rough, and interesting. The mountains close in upon the narrow valley up which the road climbs through Stony Clove. This wonderfully beautiful entrance to the uplands of the Catskills is worthy of attention, because the outlines of the mountains on every side plainly show that the once comparatively level and uniform plateau has been carved out by erosion into its present form. It seems clear that these knife-like edges, steep slopes, valleys and peaks were carved out by the rain. They are "weathered" into the shapes they now exhibit. This will be still more evident in other places. After passing the Clove the road enters a comparatively level tableland and ends abruptly and with a grand surprise upon the sheer edge of the once giant table.

Another shorter, and in some respects more sensational, approach is by way of the town of Catskill. This point may be reached by the New York Central Railroad by taking the ferry at Greendale station, or by boat, or by the West Shore Railroad. At this point begins the short and most interesting ride over the Otis Inclined road, which runs west 10 miles from Catskill and, then by means of a cable, climbs directly up the face of the eastern wall. This is one of the most remarkable rides in the world, because the view, as the car ascends, gives at every turn

of the wheels a wider and wider view over the Hudson valley and, far away to the east, to the Berkshire Hills. The view from the top is already famous, having been often described, and is worth all the trouble of a long journey to see.

A third route, and the most instructive of all, is from Catskill by road up the Kaaterskill valley or Clove. The first 10 miles to the entrance to the valley is through a rolling, farming country, and should be carefully examined, because the winding road passes over three of the great pages of the earth's story-book. At Catskill, and for the first two or three miles, the road is over very ancient slates, mementos of the old Silurian sea that once covered the State. Chance exposures of these slates show that they have been very much distorted and bent out of their original horizontal positions by the terrific squeezing together caused by the shrinkage of the earth's crust. Leaving these slates we pass over ridges of younger limestones and then still younger slates and sandstones, and wherever exposed to view along the road all appear to be tilted up or having a slight slope to the west. All the time there are glimpses of the higher and far younger rocks of the Catskills, till at last the great banded gray wall rears itself before us as if to bar the way. Then follows the four-mile ride up the steep, winding road that leads to Haines Falls and the mountain top.

The most striking things about this wonderful valley road are the views it gives of the stony skeleton of the mountains. At the very gateway of the Clove we can see a sheer wall of the rock from its smooth water-worn base in the brawling brook up to the topmost shelves of rock that seem ready to fall into the deep valley below. Here is the open page of the Catskill story. We can see the bands of rock laid down through the ages. Some are hard and, resisting the weather, stand out in overhanging sheets. Others are softer and are hollowed out, and appear to be crumbling into thin, slaty fragments. Nowhere in the eastern part of the State can be seen a more remarkable exhibit of stratified rocks showing every change of the seasons and years through which these muds, sands, and gravels were laid down in the old sea. Added to this historic interest of the ride is the wonderful and ever-increasing beauty of the mountains, the woods and stream. The green walls of forest close in on every side, and at each turn of the road new beauties of slope and crag appear, till the journey ends at the very point of the grand cañon as we cross the bridge above the roaring falls, and are in the uplands of the Catskill plateau. From the residence park at the head of the cañon are magnificent views down the narrow valley and out over the wide sunny valley of the Hudson 2,000 feet below.

The Catskills have no commercial value. They are unfit for farming purposes, and are clothed with forests, once very valuable, but now ruined by the too greedy lumbermen, and of only slight present value. The whole range is a comparatively useless wilderness. The rocks themselves have some value, for the mountains are one vast storehouse of bluestone. A wilderness, it is true, but a great and precious heritage for all the people. The Catskills make one of New York's greatest assets, for they are at once a summer home, a sanitarium, and vast

CATT — CATTI

people's camping and forest park. It is something that so magnificent a prospect as that from the top of the eastern wall is in easy reach of the city of New York. It is something that so much of beauty of mountain and valley are in sight of a dozen towns, and in sight of the thousands passing up and down the Hudson valley. A wilderness, perhaps, but a precious wilderness to be forever preserved for the delight and instruction of the people of this country.

The chief impression left upon the mind of the visitor at the Catskills is wonder that a once great and probably level plateau should be carved into such sharp peaks and cañon-like valleys. Could the rain have carved out the rocks to these forms? The rain and the frost, aided by the peculiar slaty character of the rock, undoubtedly did in the long centuries carve the great plateau into its present mountain-like form. Part of the rock is comparatively soft, all of it is full of fissures and readily splits apart under the expansion of ice formed in its fissures. It is quite possible that all of it was once softer and more plastic than now, and the process of tearing down by ice and floods may have been more rapid than at present. However this may be, it is clear that the Catskills are the true children of the rain, whose soft persuasive fingers carved the plateau into its present beautiful mountains and spread the broken wastage far and wide over the country below. In this work of the weather we have also to recognize that the glaciers of the Ice Age may and probably did largely help in the work of modeling the mountains. The great heaps of glacial rubbish at the lower entrance of the Stony Clove valleys would indicate that a vast amount of rock was removed during the time when the plateau was covered with ice. The floods that followed the melting of the ice also helped in the work of carving the peaks and cañons that we so much admire to-day.

CHARLES BARNARD.

Catt, Carrie Lane Chapman, American suffrage reformer: b. Ripon, Wis. She was educated at the State Industrial College of Iowa and subsequently studied law. She was for three years principal of the High School at Mason City, Iowa, and in 1884 was married to Leo Chapman, editor of the *Mason City Republican*, who died some two years later. Since 1890 she has devoted herself to woman suffrage work, lecturing frequently in behalf of the movement, and as chairman of the National Organization Committee doing very much to place the reform on a substantial basis. She has been associated in recent years with nearly all of the important gains which have been made in this direction, and the carrying of several state amendments relating to equal suffrage has been attributed to her influence. In 1891 she was married to G. W. Catt (q.v.). She was elected president of the National American Woman Suffrage Association in 1903.

Catt, George William, American engineer: b. Davenport, Iowa, 9 March 1860; d. 1905. He was educated at the Iowa State College and subsequently studied engineering and law. He was chief engineer of the San Francisco Bridge Company, 1887-92; president and engineer of the New York Dredging Company, 1893-9; and president and engineer of the Atlantic Gulf & Pacific Company from 1899. He has built government dry docks at the navy yards at League Island, Philadelphia, and Mare Island, California.

Cattaro, kät'tä rō, Austria, a seaport in Dalmatia, at the foot of the Gulf of Cattaro, on the east side of the Adriatic, 38 miles southeast of Ragusa. It lies at the foot of steep limestone rocks, strongly fortified and surmounted by a castle, and is surrounded with walls. The buildings are in the Venetian style, and the streets are narrow, irregular, and dark. It is the seat of a Roman Catholic bishop, and the cathedral is a well-built edifice. The harbor is spacious, but there is not much trade. Pop. (1903) about 6,000.

Cat'tegat, a gulf of the North Sea, between North Jutland to the west, Sweden to the east, and the Danish islands of Zealand, Funen, etc., to the south; about 150 miles from north to south, and its greatest breadth about 90. It is difficult of navigation, being not only shallow toward the shores, and irregular in depth, but obstructed by several sand-banks, and the adverse winds which often prevail here increase the danger. The Cattegat is noted for its herring-fishery. It contains the islands Samsöe, Anholt, Lessöe, and Hertzholm.

Cattell, James McKeen, American psychologist: b. Easton, Pa., 25 May 1860. He graduated at Lafayette College in 1880, and studied at Leipsic, Paris, Geneva, and Göttingen. He was assistant under Wundt at the University of Leipsic, professor of psychology in the University of Pennsylvania in 1888-91, and became professor of experimental psychology in Columbia University in 1891. He is co-editor of the 'Psychological Review' and 'Science.'

Cattell, William Cassidy, American educator: b. Salem, N. J., 30 Aug. 1827; d. Philadelphia, Pa., 11 Feb. 1898. He was graduated at Princeton in 1848, and at Princeton Theological Seminary in 1852. He was professor of Latin and Greek in Lafayette College, 1855-60, and president of that institution, 1863-83, and subsequently prominent in the Presbyterian Church.

Cat'termole, George, English water-color painter: b. Dickleburgh, near Diss, Norfolk, 8 Aug. 1800; d. Clapham, Surrey, 24 July 1868. Like Turner and William Hunt, he started in life as a topographical draughtsman, and was employed as a draughtsman on Britton's 'English Cathedrals' when only 16. He drew the designs for the illustrations of various annuals, the *Waverly Novels*, for an edition of Shakespeare, and for his brother's 'History of the Civil Wars.' In 1833 he was elected a member of the Society of Painters in Water-colors. He was a member also of the Academy at Amsterdam, and of the Belgian Society of Water-color Painters. He obtained a medal of the first class at the Paris Exhibition of 1855. In 1851 he resigned his membership of the English Society, and devoted himself to oil-painting. Among the best known of his pictures are 'Hamilton of Bothwellhaugh about to Shoot the Regent Murray'; 'Luther at the Diet of Spires'; 'The Armorer's Tale'; 'A Terrible Secret,' etc.

Catti, kat'tī, one of the most renowned and valiant of ancient German tribes, inhabiting what is now Hesse, also part of Franconia and Westphalia. They carried on bloody wars with the Hermunduri and Cherusci. In the time of Cæsar they dwelt on the Lahn, and



"ROUNDING UP" CATTLE ON A GREAT WESTERN RANCH.

CATTLE — CATTY

opposed him with effect. Drusus defeated without reducing them. In the reign of Marcus Aurelius they made incursions into Germany and Thrace, but were afterward defeated by Didius Julianus. In 392 they made their last appearance in history in union with the Franks. According to Cæsar, their territory was divided into 100 districts, each of which was obliged to send annually 1,000 men into the field, whose place was supplied the following year by those who had before remained at home to cultivate the ground. Their food was milk, cheese, and game; their dress the skins of animals. Their limited princes, who governed in connection with a diet, annually distributed the lands among the families.

Cattle, a term of rather indefinite use, but usually referring to domestic animals of the bovine family, more specifically termed oxen. The various domestic races will be found treated under BUFFALO, DAIRYING, DOMESTIC ANIMALS, and OX; wild oxen under AUROCHS, BISON, BUFFALO, URUS, etc.

Cattle Feeding. See NUTRITION OF FARM ANIMALS.

Cattle-plague, any plague by which large numbers of cattle are destroyed. Such plagues have existed at intervals, more or less, in all countries and in all ages. Among the severer visitations in centuries preceding the 19th may be mentioned a great plague which arose in Hungary in 1711, whence it spread to other countries, destroying in the next three years about 1,500,000 head of cattle. A second visitation, which affected England and the west of Europe between 1745 and 1756, caused the death of 3,000,000 cattle. See RINDERPEST.

Several of the diseases of cattle are due to insects, including that called "pleuro-pneumonia" or "Texas cattle fever," which is caused by a blood-inhabiting sporozoon that is carried by ticks from an infected animal to a healthy one, communicating the disease. Cattle bred in the southern States have become practically immune, but the disease affects and kills northern cattle. The natural limit of the tick concerned (*Boophilus annulatus*) nearly coincides with Mason & Dixon's line, and federal laws prohibit the shipping north of any cattle from south of this line, except between 15 November and 15 February. Other species of this same genus of ticks transmit similar cattle diseases in various parts of the world, especially the "blue tick" (*B. decoloratus*) of South Africa. The remedy is to dip the cattle in vats of cotton-seed oil or some similar mixture. See CATTLE-TICK.

The appellation "cattle-plague" is also loosely given to another disease among cattle in the United States, which is otherwise known as "lumpy-jaw," a most virulent and incurable affection. Experiments have been time and again ineffectually tried to find a cure for this, though large governmental encouragement has been offered. A rigid examination of cattle is made by government inspectors at all receiving and shipping ports.

Cattle-tick, or **Texas-fever Tick**, an arachnid (*Boophilus annulatus*) related to the mites, and prevalent in the western and southwestern States. It is a reddish, coriaceous, flattened, or swollen creature from a quarter to half an inch

in length. The cattle-tick lays a great many eggs, nearly oval, dark-brown, coated with a hard secretion, the process of egg-laying lasting for several days or a week. The young tick, on hatching, is whitish, afterward turning brown; it has three pairs of legs. After molting it becomes a nymph, when the fourth pair of legs is added. During the nymph stage the reproductive organs develop. After another molt it becomes sexually mature. It completes its development from the larva to the adult on cattle. After this second molt the couple pair, and the male grows but little. The female, voraciously feeding on the blood of her host, grows to a gigantic size, her body swelling and becoming gorged with blood and eggs. The males can be easily detected by their smaller size, and by the extension of the shield over the entire back. Ticks live upon the blood of their host. The females, as they increase in size, store away quantities of the ingested food in an immense convoluted chamber or appendage of the stomach. In summer only three or four days after the final molt are necessary for the ticks to become large. When fully gorged, and the eggs have become fertilized, the female loosens her hold in the skin of her host, and falls to the ground, where she lays her eggs, after which her body contracts, shrivels up, and then dies. The young ticks get access to cattle by climbing bushes, whence they reach out and attach themselves to passing animals.

It has been proved that ticks, by sucking the blood of cattle infested with the Texas fever germ, which is a sporozoon (*Apiosoma bigeminum*), may communicate the disease (bovine malaria) to healthy cattle, just as the sporozoon blood-parasite of yellow fever, or of malaria, is communicated by a mosquito (*Anopheles*). In dealing with ticks it should be remembered that it breathes by spiracles, or minute holes in the sides of the body. By the use of oil, or any greasy substance, those openings may be covered, thus asphyxiating the creature. The ticks may thus be killed by dipping or spraying the cattle with cotton-seed oil. Cattle should be kept away from wooded or bushy pastures.

There are one or two forms very closely allied to the Texas cattle-tick, and named *Boophilus australis*; they are regarded by experts as either distinct varieties or species from *B. annulatus*. They transmit the cattle-fever in the countries above named. Another sub-species or variety, the blue tick (*B. decoloratus*) in South Africa transmits the same disease in that region.

The Lone Star tick (*Amblyomma unipuncta*) is, next to the cattle-tick, to be held responsible for the transmission of the Texas fever. It may be recognized by the simple bright silver spot on the back.

Consult Curtice, 'The Cattle-Tick' ('Journal of Comparative Medicine and Veterinary Archives' 1891-2); Salmon and Stiles, 'Cattle-Ticks of the United States' ('17th Annual Report of the Bureau of Animal Industry,' Washington, 1902).

Catty, a standard of weight in China and the Malayan Archipelago. In China, the Straits Settlements, Java, British North Borneo, etc., it is approximately one and a third pounds. The Siamese catty is equal to 2.675 pounds.

CATUBANGANES — CATULLUS

Catubanganes, kâ-too-bän gans', or **Catabangenes**, warlike tribes settled in the mountains of Guinayangan, in the province of Tayábas (Luzon). Through lack of available information nothing can be said about their race affiliations, whether they be pure Malay or Negrito-Malay. They are probably Remontados mixed with Negrito blood and gone wild.

Catubig, kä-too-big', Philippines, a small town in the island of Samar, 48 miles north of Catbolagan. The place is garrisoned by United States troops, who, in June 1900, withstood an attack by 600 insurgents. This episode was a stirring incident of the war. Pop. 9,565.

Catullus, Gaius Valerius, Roman poet: b. Verona 87 or 84 B.C.; d. probably 54 B.C. He is deemed by some to be Rome's greatest lyric poet, by others to be second only to Horace. His family seems to have had social standing and at least moderate means; for his father often entertained Julius Cæsar, and the poet apparently never had to earn his living. While still a youth he could go to Rome and there complete an excellent education. It was in the expensive metropolis, too, that he chiefly resided, although his native town and his villa at Sirmio on the Lago di Garda, and another not far from fashionable Tivoli, would from time to time claim his presence. His one trip abroad may have been a financial venture, but it was perhaps mainly to visit the storied cities of the East that he joined the staff of Memmius, who governed Bithynia in 57-56 B.C. The provincials proved too poor to yield profit even to an unscrupulous official, much less to one of his suite, and Catullus vented his spleen in lampoons that contrast strikingly with the eulogies of the other great contemporary poet, Lucretius, who revered Memmius as his patron. Catullus' trip did, however, allow a visit to the grave in the Troad of his only brother. His expressions of inconsolable grief are among the most affecting in Latin literature. In lively contrast are the two inimitable poems that voice his joy at returning home. The year's absence had at least quenched the last embers of his passion for Lesbia, who had been for some years the curse and inspiring genius of his life. According to the generally accepted theory, Lesbia is his pseudonym for perhaps the most remarkable woman of the day, Clodia, the sister of Publius Clodius Pulcher. She was at least 7, and perhaps 11, years older than Catullus, and in 61 B.C., when he fell in love with her, was the wife of Metellus Celer, a consul-elect. Apparently even Cicero did not wholly escape the fascination of this beautiful though utterly dissolute queen of the Roman "fast set." The course of the poet's liaison may be traced in a series of poems that expose his inmost feelings with a power and vividness that critics deem almost unequalled. To the period of difficult courtship belong madly passionate lyrics and the dainty "sparrow-songs." Next a lovers' quarrel and reconciliation engage our sympathies. Soon, however, the poet's faith in Lesbia's fidelity wanes, and with it all purer love, although his passion grows only the wilder and more intense. The poems in which he assails successive rivals, beginning with the brilliant but disreputable Cælius Rufus, are marvels of invective. It is only after his return from

Bithynia that Catullus seems fully to appreciate the hopeless infamy of his former mistress, when he sends a scalding reply apparently to a proffer of reconciliation. While it is this cycle of love poems that has immortalized Catullus, he wrote admirably on other subjects. In spite of a life of pleasure, he had energy to study thoroughly the early Greek lyric poets, and especially the technical achievements of the Alexandrine school, which began now to have great influence upon Latin poetry. Although some direct translations from the Greek also attest his interest in these models, Catullus remained peculiarly independent. No matter how much his lyrics may show the results of his studies, they were primarily an outlet for feelings that compelled utterance, and not, like Horace's odes, a purely intellectual performance. He is less original in some of his long poems. The longest is an epyllion, after the Alexandrine style, upon the wedding of Peleus and Thetis, introducing also the story of Theseus and Ariadne. While Catullus' work in mythological epic no doubt made that of later writers, including Vergil, easier, his daring dithyrambic poem on Attis has remained unique. On the other hand, his epithalamia are the forerunners of others in Latin literature, as also of the marriage poems of Spenser, Jonson and Herrick. Horace also often appears in his odes the older poet's debtor, though in artistic form his superior. In epigram Martial is ready to concede the palm to Catullus as well as Marsus, though himself the acknowledged master of that form. Furthermore, in the leading elegiac writers, Tibullus, Propertius, and Ovid, we clearly see their obligations to Catullus and often read his praises. He enjoyed, too, the admiration of contemporary writers, and not alone those of his own school of poetry, like Calvus and Cinna; for the historian Nepos seems to have started him auspiciously in his literary career. To him he gratefully dedicated a partial edition of his poems. Other famous Romans that receive kindly mention are Asinius Pollio, Hortensius, Cicero's great rival in oratory, and Cicero himself. Cæsar, however, is attacked with a fearlessness as amazing as the language is shocking. But in judging Catullus' obscenities, his liaison with Clodia, and other even less creditable relations, moderns are charitable in proportion to their knowledge of the standards of that age. Even the severest are won to sympathy, if not affection, by happier glimpses of the poet's character. In an age of insincerity every word of his rings perfectly true. His gentler side appears in his verses on babies, flowers, and the beauties of nature, in his affection for his brother and his friends, and even in the better aspects of his love for Lesbia. Besides the English poets already named, Prior, Gray, Byron, Landor, and Tennyson have shown especial admiration of Catullus. Among numerous excellent editions of the poet, the text edition of Ellis (Oxford, Clarendon Press, 1904) may be named. Besides the commentary by Ellis (second edition 1889), the English reader has the poetical translations of Theodore Martin, those in prose by Francis W. Cornish (Cambridge University Press), and, perhaps, best of all, Hugh Macnaghten's 'The Story of Catullus.'

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CATULUS — CAUCASUS MOUNTAINS

Cat'ulus, Quintus Lutatius, Roman general, historian, and poet: b. about 152 B.C.; d. 87 B.C. He was consul in 102 B.C. with Gaius Marius, and in the following year was proconsul. During his proconsulship he, with Marius, defeated the Cimbri near Vercellæ, the modern Vercelli, in northern Italy. As one of the aristocratic party and a partisan of Sulla, he was proscribed by Marius. With the exception of two epigrams nothing of his work has survived.

Cauca, kow'kã, Colombia, one of the nine departments of the Republic, bounded on the northwest by Panamá; on the north by the Caribbean Sea; on the east by the departments of Bolivar, Antioquia, Tolima, and Cundinamarca, and the Republics of Venezuela and Brazil; on the south by Brazil and Ecuador; on the west by the Pacific Ocean. The territory of Caquetá and the districts of Huila, Inzá, and Páez are included in this department. The eastern part of Cauca is watered by the Amazon and some of the affluents of that river; the Guaviare and the Casiquaire flow into the Orinoco; the Atrato empties into the Gulf of Urabá; while a dozen smaller rivers flow into the Pacific. On both the Caribbean and Pacific coasts there are several ports. For area, population, etc., see COLOMBIA.

Caucassia, that division of European Russia lying in the extreme southeastern part of the empire (38° – 46° 30' N.), between the Black and Caspian seas, and bounded on the south by Asiatic Turkey and Persia, and on the north by the provinces of Rostav and Astrakhan. It covers an area of 180,843 square miles, and is divided into two separate divisions by the Caucasian Mountains, on the north Cis-Caucassia, on the south Trans-Caucassia.

Topography, etc.—The physical features are greatly diversified and present an irregular succession of mountains and valleys, table-lands, and plains, making description extremely difficult. The central section of the country is one vast mountain-top, 700 miles in length and covering an area of over 12,000 square miles. From the range of mountains the plains of Cis-Caucassia on the north gently slope, ending in the Steppes, a low, marshy country; throughout Trans-Caucassia on the south are chains of mountains running parallel to the central range. The Kuma and Terek rivers, flowing into the Caspian Sea, and the Kuban River, flowing into the Black Sea, drain the northern section, while the southern part is drained by the Kur and the Aras, its affluent, emptying into the Caspian, and the Rion, leading to the Black Sea.

Industries.—Agriculture is the most productive occupation of the settled inhabitants of the southern section, the principal crops being wheat and other cereals, cotton, and tobacco. In Cis-Caucassia cattle-breeding is the principal industry, while in the mountainous regions mining is carried on to a great extent, the mineral deposits being very rich, copper, silver, iron and magnese ores, cobalt, sulphur, quicksilver, naphtha, and rock salt the most important. The region is especially rich in oil, the production of petroleum being very extensive. Rugs, woolen goods, and harness are also made. The exports and imports are rapidly growing, the exports,

valued at \$30,000,000, being about six times the value of imports.

Education, Religions, etc.—For higher education there were in 1897 about 200 schools accommodating 27,000 pupils. There were 1,380 primary schools with 90,000 pupils under the ministry of education, and 19 secondary and 1,308 primary schools with 56,000 pupils under Cossack supervision, besides numerous religious schools. The majority of the people attend the Greek Orthodox Church, but there are large numbers of Nonconformists, Gregorians, Mohammedans, Buddhists, etc.

Government, History, and Population.—The territory is governed by a general governor, acting for the emperor, and the local zemstvos administer the economic affairs of their respective districts. Caucassia is divided into 11 separate governments: on the north are Terek, Kuban, and Stavropol; on the south are Tiflis, Kars, Kutais, Erivan, Daghestan, Black Sea, Yelizavetpol, and Baku. Prior to 1770 historical information is vague, but by the end of the 18th century Russia had acquired Cis-Caucassia, and by 1829 the whole territory was under Russian dominion. The Russo-Turkish war of 1877–8 resulted in the annexation of a considerable portion of Turkish Armenia. The inhabitants are mainly Russian Armenians, Tartars, and Georgians, about 68 dialects being spoken. Pop. (1897) 9,248,695. See RUSSIA.

Caucasian (kô-kã'shan) **Race**, a term introduced into ethnology by Blumenbach, in whose classification of mankind it was applied to one of the five great races into which all the different nations of the world were divided. Blumenbach believed this to be the original race from which the others were derived, and he gave it the epithet of Caucasian because he believed, probably erroneously, that its most typical form—which was also that of man in his highest physical perfection—was to be met with among the mountaineers of Caucasus. The Caucasian race comprises the most highly civilized nations of the world, including most of the inhabitants of Europe (the Turks, Hungarians, and Fins being excluded); the Hindus, Persians, Arabs, Hebrews, and the ancient Phœnicians of Asia; and a large proportion of the inhabitants of northern Africa. See ETHNOLOGY.

Caucasus Mountains, a lofty and rugged range of mountains forming one of the natural barriers between Europe and Asia. It extends in a northwest and southeast direction from near the strait of Kerch on the Black Sea to near Baku on the Aspheron peninsula projecting into the Caspian Sea. The distance between these points in a straight line is 700 miles, but following the main ridge of the mountains about 940 miles. The range varies in width from 30 to 130 miles, and may be divided into three parts. The western portion, extending from the Strait of Kerch and the Sea of Azov to the peak of Elbruz, consists of a series of parallel ridges of stratified rocks, the ridges apparently formed by huge, tilted fault blocks. The northern slopes of the northern ridges rise rather gently out of the plain of Caucasia; the southern slopes, along the fault

CAUCHY — CAUCUS

planes, are abrupt; and the southern slope of the main ridge has in places almost vertical walls 2,000 to 3,000 feet high. There are few passes through this great barrier, and these are difficult. The snow line is at about 9,000 feet.

The highest peaks of the Caucasus are in the central part, from Elbruz to the Adai-Khokh. Here, as to the westward, is a series of parallel ridges, the higher summits all snow-clad, with deep longitudinal valleys; but some of the highest peaks, Elbruz and Kazbek, are on spurs more or less isolated from the main range. In this central portion of the Caucasus, as yet but incompletely mapped, there are said to be fully 20 summits higher than Mont Blanc, the highest peaks being Elbruz, 18,470 feet; Dykhtau, 17,054 feet; Koshtantau, 16,881 feet; Janghitau, 16,564 feet; and Kazbek, 16,546 feet. The snow line is at about 11,500 feet, and the total number of glaciers of the first class is fully 175, while rounded rock surfaces and boulders in the valleys show that glaciation was much more extensive at no very distant time. East of Kazbek the range narrows and is narrowest south of Vladikarkaz, where it is crossed by the Russian military road to Georgia. This road runs over the Kobi Pass and through the great Davial gorge, one of the greatest mountain chasms in the world. The eastern part of the Caucasus, from Kazbek to the Caspian, is of much more complicated structure; the range widening and including a high plateau crossed by subordinate ranges having an east-northeast and west-southwest direction, though what may be termed the main axis continues its southeast course.

The plains of Caucasia north of the mountains are underlaid by Tertiary and Quaternary strata. The foot hills of the western Caucasus and the plateau of the eastern Caucasus show rocks of Cretaceous and Jurassic age, and nearer the main axis of the range are Palæozoic formations. The main axis shows schists and gneisses with granite and syenite. Trachyte and similar rocks occur, and some of the peaks, Kazbek, are probably in part of volcanic origin.

The scenery of the Caucasus is wild and gloomy rather than beautiful. The lower slopes are thickly wooded, but there is not the combination of dark forests, beautiful lakes and graceful snow-crowned summits that makes some ranges—for instance the Selkirks in British Columbia—so attractive to the mountain-climber.

The mineral wealth of the Caucasus is very great; in fact, in this respect the range is one of the most noteworthy in the world, but owing in part to the very rugged topography much of this wealth is still undeveloped. Among the valuable resources may be named the coal fields near Ochemchiri and at Kuban and Kutais, the copper mines of Tiflis and Elizabethpol, and the silver ores of Terek and Kutais. More important are the manganese mines near Kutais, whence some 500,000 tons of ore were exported in 1900 to various European countries and the United States. Most important of all are the oil wells of the Aspheron peninsula, the most remarkable in the world, whence some \$12,000,000 worth of petroleum, benzine, etc., were shipped to foreign countries in 1900. Consult: Bodenstedt, 'The People of the Caucasus'; Deniker, 'Races of Man'; Keane, 'Man, Past and Present'; Ripley, 'Races of Europe.'

Cauchy, Augustin Louis, ô-güs-tăn loo-ē kō-shē, French mathematician: b. Paris 21 Aug. 1789; d. there 23 May 1857. He published in 1815 a 'Treatise on the Theory of Waves,' which was afterward made the basis of the undulatory theory of light. Between 1820 and 1830 he wrote several important treatises, and at Prague, where he resided as tutor to the Comte de Chambord, he published his 'Treatise on the Dispersion of Light' (1837). From 1848 to 1852 he was professor of astronomy at Paris, but refused the oath of allegiance to Napoleon III., and lived in retirement till his death. See 'Life,' by Valson (1868).

Caucus (short for "caucus club"), a political party gathering for nominations or conference on party policy, as distinguished from a merely hortatory one. It may be a town or ward meeting, to nominate local candidates or delegates to higher nominating conventions (the latter sort are also called "primaries"); or a party conference of members of Congress or a legislature, to decide on members or confirmations to office. Originally, a secret gathering on the model of the Caucus Club of Boston, whose leading business was the making of "slates" for local offices, and incidentally came to be the molding of a policy of local autonomy in opposition to British influence. The etymology of the name is pure guesswork. The usual derivation from "caulkers" (sc. club), or an imaginary "caulk-house," is most improbable. More plausible would be that from Lat. *caucus*, Gr. *kaukos*, a cup, as originally a convivial society, most secret societies of that day having classical names or initials; the words, however, are not classical, but mediæval, and so are less likely to have come under their notice. Possibly, though not probably, it is mere alliterative comic jargon. Most probable of all is the adoption of an Algonkin word, *karw-karw-wus*, to consult:—if the word is real: cf. "pow-wow." At all events, the club and the elements of the system originated in Boston during the 18th century. Samuel Adams' father was accredited as a founder and eminent master of the art, in which his son became immortal, and to which he owed his first election to the legislature. The preparation and distribution of ballots before the election was one of its chief instrumentalities. The first mention of the original club is in John Adams' diary, February 1763: he says the town officers are "regularly chosen there before they are chosen in the town," and intimates that the distribution of business favors as a *quid pro quo* was not absent, which might be assumed.

The system rapidly grew; indeed, in some form it is part of the inevitable machinery of majority rule, which in constitutional countries has supplanted the primitive decision of battle by merely counting the opposing hosts, it being assumed as a basis that the larger could outfight the smaller. But for common action of that majority there must be some method of determining its will before the elections, as to both measures and men; and all countries with any measure of popular control have some shaping and testing mechanism of the sort. In England it has been formally established since 1880, by the so-called "Birmingham system"; but in the higher lines of policy, even before that, the two great political clubs of London, the Carlton and the Reform, Conservative and Liberal, discharged much of the functions of

CAUCUS

informal caucuses. Nevertheless, the power of the caucus is greatly affected by local and national circumstances. In England and most continental countries, it is restrained by the still powerful aristocratic system, which forms a counterpoise and provides natural leaders; in France, by the centralized government system. In no other country has it the same authoritative power as in the United States. Early in our history it became universal. Said Adams in 1814: "We have Congressional caucuses, State caucuses, county caucuses, city caucuses, district caucuses, town caucuses, parish caucuses, and Sunday-school caucuses at the church doors." This is primarily due to the entire legal equality of all classes; that absence of prescriptive privileges furnishing a shelter for minorities and independent action, which is considered the chief glory or the chief danger of democracy, according to the point of view. The gradations of the American political system into national, State, district, and municipal powers have produced a corresponding hierarchy of caucuses, each sending delegates to the next higher caucus or convention, and constituting a "machine" of great efficiency and formidableness.

But it has been made at once practically irresistible, and largely worthless for its ostensible purpose of determining the general sentiment of the party, by the "spoils system," which throws the organization and management of the caucuses into the hands of those who can give their whole time to political work, because paid for this service (in reality though not in name) out of the public treasury. Thus managed, the caucus in the larger places does not necessarily represent the views of the majority, and very often the leading object is to prevent the majority from meddling with the machine. In theory, the caucus being a voluntary association of the members of a voluntary association, to deliberate as to its policy and agents, all are fairly bound by its decisions, and have no right to "bolt" afterward; otherwise there is an end of all common action. It is of course to the interest of the managers to cultivate this theory, and the military similes of "campaigns" and "forces" and "deserters" and "closing up ranks," etc., and to stigmatize all individual courses as equivalent to treachery and insubordination; and no matter how spurious this technical majority may be, or by what methods a real minority may have attained a seeming vote of confidence, a "regular" nomination will always have enormous weight. In part, it is true, this is because the vast majority have no common wish or purpose, and are destitute of constructive political ideas; and any pronouncement of the constituted party authorities is really their will, which is simply to obtain such a mandate. Hence, "regularity" is the test of merit; and this willingness to accord to the show what belongs to the substance is the almost invincible bulwark of political corruption.

This has generated in the last few years a host of efforts, public and private, to break down the monopoly of the caucus and substitute a real and direct control of nominations by the party; control of policy cannot thus be shifted, but corruption is the work of men, not of measures. It cannot be said that any of these movements as yet are very successful or promising, largely owing to the consideration just

mentioned, that the initial possession of political ideas is a condition precedent to expressing them. One scheme is to have nominations made by direct popular vote instead of by primaries; but this simply shifts the function of the caucus one stage back, to decide on the votes for nomination instead of the votes for offices. More elaborate, and in some directions more efficient, are the legislative provisions made in several States for taking the primary caucuses themselves under the control of the law, as elections have always been. In this case, all persons who wish to vote in a party caucus must register themselves as members of that party. The effects of this measure have been a singular mixture of good and evil, and probably reflect in this regard the motives of the enactment. On one hand, faction leaders can no longer swamp a caucus with a rabble of purchased voters from the lowest element of the other party. In theory a check list was always used; but as it had no legal validity, it was scouted whenever a majority, real or spurious, was interested in evading it. The check list under the law cannot be so treated. On the other hand, an obvious effect of the law, probably not absent from the minds of the framers, is to extinguish as a party force the independent or "mugwump" element of both parties, who try to reform their own party by a leverage obtained from the other; and are therefore excluded from either, as they cannot keep changing registration. If this was a motive, the Nemesis has been speedy. The party managers in various places are greatly disappointed and alarmed to find that only a fraction even of their normal and calculable voting strength will register at all, and therefore they are nominating in the dark, without knowing what the party sentiment is. When they honestly wish to ascertain the party feeling, they have great difficulty in doing it. The dislike to sporting a registered, public, and unchangeable party label is not confined to the more intellectual independents, but is strong in the general mass; and the attendance at primaries is a much less sure guide than of old to what the party will support at the polls. The precise future of the caucus cannot be forecast; but there is little evidence thus far of a loosening of its hold.

Congressional Caucuses for President and Vice-President.—These grew out of the Electoral system (see ELECTORAL COLLEGE), and perished, significantly, at the same time that the old theories of an educated official class and professional trained office-holders gave place to the inrush of the untrained democracy and rotation in office. It is no mere coincidence that the last Congressional caucus was held to nominate a candidate in the last election that returned a President of the old school. The masses were taking everything into their own hands; Jackson and popular nominations came in together, though there was one intermediate link when the people acted through the State legislatures. The theory of the Electoral system was that the electors, themselves the chosen sages of the people, should make free choice of the best men in the country for the chief executive offices; but from the first their choice was pointed out in advance. While Washington lived and would take office, no other candidate for President was possible; and for his first Vice-President, John Adams was the choice of New England,

CAUDA-GALLI GRIT — CAUDLE'S CURTAIN LECTURES

and the other States had either their "favorite sons" or no special wish. In 1792 the same circumstances controlled; though New York's favorite, George Clinton, won the support of several southern States. The electors deferred to the notorious public feeling; but their action was nominally independent. In 1796 this was still true of the Federalists, who made a combination of North and South on Adams and Pinckney; it was substantially true of the Republicans, for Jefferson was the undisputed leader, and while the Republican members of Congress informally agreed to support Burr, there was no set ticket for the electors to support at party peril. But in 1800 both parties held regular but secret caucuses, and adopted tickets which the electors voted solidly and even stupidly, with results still memorable. The Federalists voted that Adams and Pinckney should be supported alike. The point of this was that up to that date, there was no distinct candidate for President and Vice-President, the one who received the largest electoral vote being President and the next one Vice-President. Adams was certain to receive no Republican votes; but if all the northern Federalists voted for Pinckney, he as a popular Southerner would probably receive some stray votes from that section, and so be elected President over Adams, whom the Federalists hated but did not wish to bolt. Thus they would defeat him by appearing to keep strict party faith. The Republicans on their part held a caucus, and made a similar agreement with regard to Jefferson and Burr; not with similar designs, but to placate New York, which complained that her candidates were "knifed" in the South. Of course in both cases, if the whole electoral body voted "straight," there would be a tie and no election. This actually happened in the case of Jefferson and Burr, and the struggle was only settled after 36 votes. The results were the adoption of the Twelfth Amendment to the Constitution, regulating presidential elections and compelling electors to state which candidate was to have which office; the implacable hostility of Jefferson to Burr, which killed the chance of the latter to rise further in his party, drove him into the arms of the Federalists, and ultimately ended in the murder of Hamilton; and as the presidential electors had simply voted the tickets dictated by the party representation in Congress, they instantly became as they have ever since remained, nullities. The second occasion was on 29 Feb. 1804, when the Republicans (in open, not secret caucus) renominated Jefferson; they dropped Burr for George Clinton (New York still keeping the place), by 67 votes to 20 for Hugh H. Breckinridge of Pennsylvania, and some scattering. The Federalists held no ostensible caucus; but as they were scheming to support Burr for governor of New York, and with that prestige nominate him for President, the plan must obviously have been agreed on in what served the purpose of caucuses. Burr's killing of Hamilton spoiled this scheme, however: they nominated Pinckney and King, and were almost annihilated. The third caucus was on 23 Jan. 1808, also by the Republicans; but only two thirds of the party members attended, as the conclusion was foregone. Madison and Clinton were nominated. Meantime the Virginia legislature had split into Madison and Clinton

factions, the former much the stronger; nominated separate sets of electors and carried the quarrel into Congress, where Monroe's party issued a manifesto protesting against both Madison and Congressional caucuses. The Federalists held none, and renominated their previous candidates. On 18 May 1812 the Republican or Democratic party held its fourth caucus, and renominated Madison on his express agreement to declare war against Great Britain; also nominating Elbridge Gerry for Vice-President. This time they appointed a national committee to see that the nomination was respected. The New York Democrats, however, were very restive under the "Virginia dynasty" and the "secretary of state dynasty"; and their members of the legislature held a caucus, nominated George Clinton, and protested against the Congressional caucus as always nominating a Virginia candidate. A secret caucus or convention of Federalists was held in New York in September, adopted the Clinton nomination, and nominated Jared Ingersoll for Vice-President. On 29 March 1816 the Democrats, now practically the only existent party, held the last caucus which accomplished anything. Henry Clay and another member introduced resolutions that the caucus nominations be abolished, but were voted down; and Monroe was nominated, by no great margin over Wm. H. Crawford of Georgia. Daniel D. Tompkins of New York was nominated for Vice-President. In 1820 a caucus was summoned, but only about 50 members responded, and they took no action. The general feeling was now strong against the system, as there was but one party, and a nomination by Congressional caucus was equivalent to allowing Congress to appoint the President and Vice-President. In 1824 several State legislatures passed resolutions forbidding the State representation in Congress to attend a caucus if one were called. But the Crawford party, who wished to give his nomination the prestige of a national verdict, held one at which about a fourth of the members attended, and nominated him and Albert Gallatin. It can hardly have gained him much support, however, and a paralytic stroke finished whatever chance he might have had. In the next (1828) campaign, the State legislatures made the nominations; and in 1832 the nominating convention was introduced. See UNITED STATES — BEGINNINGS OF PARTY ORGANIZATION.

Cauda-galli Grit, or **Esopus Shale**, one of the basement members of the Devonian System in New York and New Jersey. The name ("cock's tail") is from a characteristic fossil, supposed to be a seaweed.

Caudex, in botany, the stem of a tree, more especially the scaly trunk of palms and tree-ferns. It often appears as a rhizome running along the surface of the earth or underground.

Cau'dine Forks, a pass of southern Italy, in the form of two lofty fork-shaped defiles, in the Apennines (now called the valley of Arpaia), into which a Roman army was enticed by the Samnites, 321 B.C., and being hemmed in was forced to surrender.

Cau'dle's Curtain Lectures, Mrs., a series of humorous sketches by Douglas Jerrold (q.v.).

CAUER—CAUS

Cauer, Emil, ā'mēl kow'ēr, German sculptor: b. Dresden 29 Nov. 1800; d. Kreuznach 4 Aug. 1867. He studied at Berlin under Rauch and at Munich under Haller; in 1825 he went to Bonn where he was instructor in art at the university; in 1832 he was appointed drawing master at the gymnasium at Kreuznach. Among his best works are 'Sickingen'; 'Charles V.'; 'Melanchthon'; and the representations of Red Ridinghood and other fairy tale characters. He also restored the antiques in the museum at Dresden.

Cauer, Karl, German sculptor: b. Bonn 14 Feb. 1828; d. Kreuznach 17 April 1885. He studied with his father, Emil Cauer (q.v.), and with Wolff in Berlin; he also visited London several times in order to study the Parthenon friezes. Among his works are the Schiller monument at Mannheim, 'The Witch' and a number of portrait busts. In his later life he became interested in the question of coloring sculptures, and made a number of experiments in that line.

Caughnawa'ga, kô-nä-wä'ga, Canada, a town in the province of Quebec, situated on the St. Lawrence River, near the Lachine Rapids, opposite Lachine. It is an Indian town, and was established by the Jesuit missionaries in 1676 as a colony for the Indians who were converted to Christianity. The converts were Iroquois, mostly Mohawks, and remained loyal to the French during their quarrels with other Indians and the English. In the Canadian insurrection of 1838 Caughnawága was the first place to be attacked by the rebels, who were repulsed by the Indians and a number of them taken prisoners. Pop. 2,000.

Caul, a membrane enclosing the viscera, such as the peritoneum or part of it, or the pericardium; also the amnionic membrane that surrounds all foetal structures and sometimes becomes caught by the head of a child at birth. Many superstitions have been connected in the past with cauls. The child that happened to be born with one was esteemed particularly fortunate; and the possession of it afterward, however obtained, was highly prized, as of a charm of great virtue. The superstition is thought to have come from the East. With the French, *etre né coiffé* was an ancient proverb, indicative of the good fortune of the individual. The alchemists ascribed magical virtues to it; and, according to Grose, the health of the person born with it could, in after life, be judged of by its condition, whether dry and crisp, or relaxed and flaccid. Medicinal virtues were imputed to it by the ignorant, as well as the property of preserving the owner of it from drowning. It has been bought and sold occasionally at a high price, sailors having been known to give as much as \$150 for a single caul.

Caulaincourt, kō-län-koor, **Armand** (är-män) **Augustin Louis de**, DUKE OF VICENZA, French statesman: b. Caulaincourt (Aisne), 9 Dec. 1772; d. Paris 19 Feb. 1827. He early distinguished himself as an officer, was made a general of division in 1805, and shortly after created Duke of Vicenza. Faithful to the last to Napoleon, he was made Minister for Foreign Affairs in 1813, and during the Hundred Days resumed the office, receiving

a peerage of France, of which he was deprived after the Restoration.

Cauliflower, a member (*Brassica oleracea*, var. *botrytis*) of the cabbage tribe, derived from the same original species as cabbage (q.v.), from which it differs in having a more or less compact head of metamorphosed flowers and adjacent parts instead of a bud-like head of densely packed leaves. Broccoli is a late hardy form of cauliflower not widely grown in America. Cauliflower is more delicately flavored than cabbage, like which it may be cultivated and prepared for the table. In its cultivation, however, it seems to be more difficult to bring to perfection unless conditions, especially moisture and temperature, are just right. The essentials of its cultivation are highly fertile soil well drained, but well supplied with moisture, a moist climate or season, and shelter from the direct rays of the sun, as on a northern slope, or reduction of the intensity of the sun's heat by planting either very early so as to mature in spring, or late so as to mature after mid-autumn. The heads produced in midsummer are generally inferior in both size and quality. When the heads begin to develop, the leaves are tied above them so as to keep out foreign materials, but mainly to make the heads whiter and more attractive to the purchaser. In preparing for the table the finer heads are usually served with a cream sauce; the poorer ones being pickled. In comparison with cabbage seed, the seed of cauliflower is very expensive because of the difficulty of maintaining its high quality. Formerly the seed was imported from Denmark and Germany, but Washington and British Columbia have been gaining in the market with their cauliflower, cabbage, and other related seeds.

Cauliflower suffers from the same enemies that attack cabbage. Consult: Bailey, 'Cyclopedia of American Horticulture'; Allen, 'Cabbages, Cauliflowers, etc.'

Caulking, **Calking**, or **Cauking**, the act of rendering the seams of a ship water-tight by driving oakum, cotton, or the like, between the planks in the ship's decks or sides, in order to prevent the entrance of water. After the oakum is driven hard into the seams it is covered with hot melted pitch, to keep the water from rotting it.

Caulop'teris, a genus of fossil tree-ferns found in the coal-measures.

Caura, kow'ra, a river of Venezuela, rises among the sierras of the frontier, and flows north-northwest to the Orinoco. On both sides stretches the territory of Caura (22,485 square miles), with immense forests of valuable woods.

Caus, or **Caulx**, **Salomon de**, French engineer: b. Dieppe 1576; d. Paris 6 June 1626. He was in the service of the Prince of Wales in 1612, and of the Elector Palatine, at Heidelberg, 1614-20, but by 1623 returned to France, and became engineer and architect to the king. At Frankfort, in 1615, appeared his 'Causes of Kinetic Energy,' a work in which is described an apparatus for forcing up water by a steam fountain, differing only in one detail from that of Della Porta. There is no reason to suppose that the apparatus ever was constructed, but on the strength of the description, Arago has claimed for De Caus the invention of the steam-engine.

CAUSE — CAUSTIC

Cause, that which brings about any change in the state, condition, circumstances, etc., of things; that which produces an effect.

In philosophy, that by which something known as the effect is produced, and without which it could not have existed. To give a satisfactory notion of all the senses in which this word has been used it would be necessary to review all the teachings of metaphysics from the time of Aristotle downward. The various positions of the conflicting philosophers can here be only very briefly indicated. Aristotle states causes to be of four kinds: efficient, formal, material, and final. The efficient is the force or agency by which a result or effect is produced; the formal the means or instrument by which it is produced; the material, the substance from which it is produced; the final, the purpose or end for which it is produced. A scientific cause demands the recognition of all the essential conditions, any one of which being absent the effect could not take place. Locke finds the origin of the notion of cause in sensation. Assuming that bodies have the property of modifying each other, it is only necessary to observe them to perceive and be driven to admit the principle of causality. Hume declares the power which we attribute to one object over another to be a chimera; such a power does not exist, or if it does we can have no idea of it. What we call cause and effect is merely two phenomena always following in the same order, and which we have fallen into the habit of associating in our minds in such a way that on perceiving the first we inevitably expect the second. According to Leibnitz there is no existence, however humble, but is a force, that is, a real cause. The notion of force is the base even of the notion of existence; all that which *is* has a certain virtuality, a certain causative power. The human soul, like all the other limited forces in this world, is but a monad isolated in itself, but yet in whose inner being the whole creation is reflected, and whose movements have been from the beginning co-ordinated by Divine Wisdom with the harmonious movement of the universe. Kant's doctrine is that the notion of cause and the principle of causality certainly exist in our minds; but they are only simple forms of our understanding, or the entirely subjective conditions of thought. We are compelled by a law or a form pre-existing in our intellect to dispose all the objects our imagination represents, or all the phenomena our experience can discover, according to the relation of cause and effect; but we do not know if anything really exists, independent from our intellect, which resembles a cause, a force, or effective power. Against the doctrines of the intuitionists it has been urged that the mere statement that the mind possesses a belief in causation proves nothing: some men believe in it, others do not, and unanimity is necessary to the establishment of a universal belief. Nay, more, the mere universality of a belief is no conclusive proof of its correctness, as put in the words of the late John Stuart Mill—"A mere disposition to believe, even if supposed instinctive, is no guarantee for the truth of the thing believed. If, indeed, the belief amounted to an irresistible necessity, there would be no use in appealing from it, because there would be no possibility of altering it. But even then the truth of the belief would not follow: it would only follow

that mankind were under a permanent necessity of believing what might possibly not be true; just as they were under a temporary necessity, — quite as irresistible while it lasted — of believing that the heavens moved and the earth stood still. The things which it has been supposed that nobody could help believing are innumerable, but no two generations would give the same catalogue of them." The theological question of a First Cause is debated on the ground that matter of itself is inert, that spirit is active, that in order of existence one spirit or active force must be the first and uncaused cause.

In law, a cause is a right of suit or action; it is something for which suit may be brought by someone against another; it includes the right of action. In practice, a cause of action comes into existence when there is such a state of facts or circumstances as will enable a person or party having certain relations with particular persons or property to commence a suit. Cause includes the right, but right may not include a cause; as a person may have a right of action which is barred by lapse of time, and as soon as the time expires the cause ceases.

Causeries du Lundi, kōz-rē dū lèn-dē, a famous series of literary criticisms by Sainte-Beuve. Every prominent name in French literature, from Villehardouin and Joinville to Baudelaire and Halévy, is here exhaustively discussed. Sainte-Beuve widened the scope of criticism by inventing what has been called "biographical criticism." He endeavors to explain the work by the character of the author, his early training, his health, his idiosyncrasies, and above all, by his environment. The 'Causeries' were first published as feuilletons in the papers. They may be divided into two distinct classes: those written before, and those written after, the Restoration. In the former there is more fondness for polemics than pure literary purpose; but they represent the most brilliant period in Sainte-Beuve's literary career. After the Restoration, his method changes; there are no polemics; however little sympathy the critic may have with the works of such writers as De Maistre, Lamartine, or Béranger, he analyzes their lives solely for the purpose of finding the source of their ideas.

Caustic, in medicine, any agent that causes a destruction of the parts. Caustics act by withdrawing water from the skin, by coagulation of the albumen or by other chemical change. Thus caustic soda and caustic potash act by the abstraction of water. They further act on fats, saponifying them, and are particularly serviceable as caustics if penetration is desirable. Sulphuric acid acts in much the same way, but it is very difficult to control its caustic action. Others of the acids are used as caustics, nitric, glacial acetic, tri-chlor-acetic, etc. Many mineral salts, silver nitrate, zinc sulphate, zinc chloride, copper sulphate, arsenic, etc., are valuable caustics. The most reliable caustic is the actual cautery, using a dull red flame. Caustics are used to stimulate the growth of granulating wounds, to remove warts, condylomata, etc., to cleanse ulcers, remove cancerous growths, to prevent poisoning by dog-bites, etc.

In mathematics, the curve to which rays of light are tangent after reflection from a surface or refraction by a lens. Opticians endeavor so to shape their mirrors and lenses as to make the

CAUTERETS — CAVAIGNAC

caustic two intersecting straight lines. When this is achieved, the "spherical aberration" disappears. Caustic curves may often be seen on the bottom of a cup, produced by reflection from the curved wall of the cup. See also **LIGHT**.

Cauterets, kō-tē-rā, a watering-place in the department of Hautes-Pyrénées, France, 3,250 feet above sea-level, in the valley of the Laverdan, 42 miles south-southeast of Pau. The stationary population of the place is only about 1,300, but it is annually swelled in summer by some 20,000 visitors, for whose accommodation numerous sumptuous hotels and bathing-establishments have been built. It is a good centre and guide-station for ascents among the Pyrenees. The sulphurous springs, 25 in number, and varying in temperature from 60° to 131° F., are the most abundant in the Pyrenees (330,000 gallons per day), and have been known from Roman times; though their modern reputation dates from the 16th century, when Margaret, sister of Francis I., held her literary court and wrote much of her 'Heptameron' at Cauterets.

Cautery. See **CAUSTIC**.

Cautin, kow'tēn, Chile, a province divided into the departments of Temuco and Imperial. It has an area of 3,127 square miles, and a population of 100,000. The city of Temuco (pop. 9,000) is the capital. Principal towns are: Nueva Imperial (3,000), Lautaro (3,500), and the port of Carahue (2,000). There is a regular line of steamers between Carahue and Valparaíso. In the province are numerous lakes, one of which, Villarica, with a surface of 100 square miles, lies at the base of a volcano of the same name. The Central Railway connects the capital with other cities of the republic. The soil of the province is fertile. Wheat and lumber are produced. The urban property is valued at \$7,600,000, and the rural at \$16,000,000.

Cautin, kow'tēn, a river in Chile; flows west through a province named after it, and empties into the Pacific Ocean. Its length is about 200 miles.

Cautionary, a term used in Scotch law and signifying the "promise or contract of one, not for himself, but for another." A simple cautioner is one who binds himself conjointly with the debtor or principal for the greater security of the creditor. The creditor may proceed against the principal debtor and cautioner, or against either of them. The cautioner may, however, stipulate on the document constituting the cautionary obligation that the creditor shall take legal measures against the debtor or principal. Cautioners are frequently taken bound, conjunctly and severally, or as full debtors, with the principal, in which case both parties are liable for the whole debt. It follows, from the nature of the obligation, that a cautioner who has paid the debt has an action against the principal for relief. All cautionary obligations must be in writing, and have the signature of the cautioner attached; the conditions of contract must be clearly stated, which must be strictly observed, otherwise the cautioner is freed.

Cautionary Towns, four towns in Holland, Briel, Flushing, Rammekens, and Walcheren, so named because they were given to Queen Elizabeth in 1585 as security for their repaying her for assistance in their struggle

with Spain. They were restored to the Dutch Republic by James I. in 1616, although only a portion of the sum advanced was refunded.

Cauvery, kô'vér ĩ, **Cavery**, or **Káveri**, a river of Hindustan, to the waters of which Mysore and the Carnatic owe much of their agricultural wealth. It rises from several head streams in Coorg and Mysore, near the coast of Malabar, flows southeast through Mysore and the Madras Presidency, and after a winding course of about 470 miles falls into the Bay of Bengal by numerous mouths, the largest being the Coleroon. Where it separates Mysore from Coimbatore the Cavery forms an island called Sivasamudram, near which are two magnificent cataracts, each about 200 feet high, and more or less broken into cascades according to the volume of water. In connection with this river and its tributaries important canals and dams have been constructed for purposes of irrigation, with the effect of rendering the country on either side highly productive. The Cavery is filled by the monsoon rains in May and July, but is not navigable except by small boats.

Cava, kā'vā, Italy, a city in the southern province of Salerno, situated in the valley of Fenestra, three miles northwest of Salerno. It is the seat of a bishop, suffragan to the Pope, and contains a cathedral, three other churches, a convent, a house of refuge, a hospital, and a seminary. Silk, cotton, and linen are manufactured here, and in the numerous small villages that surround the town. The district is extremely unproductive, but the inhabitants have become wealthy by their industry and commerce. About one mile from Cava is the magnificent Benedictine convent of the Trinity, which formerly contained an excellent library, now transferred to Naples. This convent is now national property, and contains a lyceum and boarding-school. Pop. 10,000.

Cavaignac, Jacques Marie Eugène Godefroy, French politician, son of Louis Eugène Cavaignac (q.v.): b. 22 May 1853; d. Saint Calais, Dept. of the Sarthe, 25 Sept. 1905. He studied at the Lycée Charlemagne, Lycée Louis le Grand, Ecole Polytechnique, and Ecole des Ponts et Chaussées, interrupting his studies long enough to serve in the Franco-Prussian war. In 1882 he was elected to the Chamber of Deputies, and in 1885 was appointed Under-Secretary of State. In the Panama revelations of 1892 he bore a conspicuous part. On the organization of the Bourgeois cabinet, 30 Oct. 1895, he was appointed Minister of War. In August 1898, he added to the excitement over the Dreyfus prosecution by forcing Lieut.-Col. Henry to confess to a forgery of certain letters bearing on the Dreyfus case, and the accused officer committed suicide within a few hours. In the following month Cavaignac resigned his office. He was author of 'The State and Tariffs of Railroads' (1883); and 'Formation of Contemporary Prussia' (1891).

Cavaignac, Jean Baptiste, zhōn bāp tēst, French revolutionist: b. Gourdon 1762; d. Brussels 24 March 1829. He became an advocate at the Parliament of Toulouse; and in the National Convention acted as deputy from the department of Haute-Garonne. He rose to be one of the leaders of the Mountain (Extreme Republicans), and, on his various dictatorial missions to

CAVAIGNAC — CAVALIER

the armies of the Republic, displayed the greatest energy, tact, and incorruptibility. He was a member of the Council of Five Hundred; and afterward became a Councilor of State in Murat's kingdom of Naples. During the Hundred Days he acted as prefect of the Somme. He was banished as a regicide, at the second restoration.

Cavaignac, Louis Eugène, loo-ē è-zhān, French general: b. Paris 15 Oct. 1802; d. 28 Oct. 1857. His father, Jean Baptiste Cavaignac (q.v.), was a furious revolutionist, and member of the Council of Five Hundred. Young Cavaignac entered the École Polytechnique in 1820, and afterward the military school at Metz, and in 1824 joined the 2d regiment of engineers. He served in the campaign in the Morea, and in 1829 was appointed captain. Being at Arras on the outbreak of the revolution of 1830 he was the first officer in his regiment to declare for the new order of things. In 1832 he was sent to Africa, where he remained for several years, and greatly distinguished himself in defending the French settlement against the Arabs and by his judicious organization of military hospitals, barracks, and works of defense. In 1844 he received the appointment of brigadier-general, with the government of the province of Oran in Algeria.

Cavaignac was in Africa when the revolution of February 1848 took place. In March of that year he was created by the provisional government general of division and governor of Algeria. Shortly afterward the office of minister of war was offered to him, but declined. On 23 April he was chosen representative of the department of Lot in the National Assembly, and proceeding to Paris to take his seat arrived there on 17 May. The capital was then in a state of great excitement from an attempt on the assembly by the Red Republicans two days before. Cavaignac was offered again the portfolio of the minister of war, and this time accepted it. The measures which he adopted to guard against the crisis which was evidently approaching were prompt and decisive. In a few days an army of nearly 30,000 men was assembled in and around Paris, and this precaution was speedily justified by the events which followed. On 23 June, at 11 o'clock A.M., the terrible Communist insurrection burst forth, and for three days Paris presented the most dreadful scene of tumult and bloodshed which had been witnessed there since the massacre of St. Bartholomew. About 15,000 persons perished, and property was destroyed to the value of upward of \$1,000,000. By the energy of General Cavaignac, aided by the loyalty of the army and the national guard, the insurrection was suppressed on 26 June. On that day the National Assembly delegated the entire executive power to Cavaignac as dictator, who resigned it again into its hands on the 29th, and received it anew on the same day, with an acknowledgment by the legislative body of the services rendered by him to his country. Notwithstanding these he was defeated in the elections for the presidency in the month of December following, and Louis Napoleon was preferred to the office. On 20 December he resigned his dictatorship. After the *coup d'état* of 2 Dec. 1851, he was arrested and conveyed to the fortress of Ham, but was liberated after about a month's detention. In 1852 and in

1857 he was elected member for Paris of the legislative body, but on both occasions was incapacitated from taking his seat by refusing to take the oath of allegiance to the emperor. The last years of his life were spent at his country-seat in the department of Sarthe. See Montfort, 'Biographie du Général Cavaignac' (1848); Deschamps, 'Life' (1870).

Cavaille'-Coll, Aristide, ä-ris-tēd kă-vä-yä-köl, French organ builder: b. Montpellier 2 Feb. 1811; d. Paris 13 Oct. 1899. He built the organs in the Parisian churches of St. Sulpice, the Madeleine, etc., and invented the pressure method for sounding tones of different depths and heights.

Cavaillon, kă-vā-yôñ (ancient CABELLIO), France, a town in the department of Vaucluse, 14 miles southeast of Avignon, on the right bank of the Durance. It is an ancient place, and has a cathedral built between the 10th and 12th centuries. The surrounding district is one vast garden, producing excellent fruit, especially melons and peaches. A considerable trade is carried on in silk, olive-oil, fruit, early vegetables, and wool. The industries comprise straw hats, edge-tools, tanning, currying, the preserving of fruits and vegetables, etc. The Romans had an important colony here, and erected many edifices, of which almost the only remains are some tombs and the fragment of a triumphal arch. It was an episcopal city as early as the 5th century. Pop. 6,000.

Cavalcanti, Guido, gwē dō kă-väl-kän'tē, poet: b. probably in Florence about 1252; d. there 28 or 29 Aug. 1300. He was the friend of Dante, and like him a zealous Ghibelline. When the dissensions of the Guelfs and Ghibellines disturbed the public peace of Florence the citizens banished the chiefs of both parties. The Ghibellines were exiled to Sarzana. On account of the unhealthy air of that place they were permitted to return; but Cavalcanti had contracted a disease of which he died at Florence. In his youth he made a pilgrimage to St. Jago de Compostella in Galicia. Returning home through France he fell in love at Toulouse with a young lady of the name of Mandetta. To her most of his verses which we possess are addressed. They are remarkable, considering the period at which they were written, for their beautiful style. His 'Canzone d'Amore' have gained him the most fame. The learned Cardinal Egidio Colonna and some others have made commentaries on it. His 'Rime,' published by Ciciaporci, appeared at Florence in 1813. See Ercole, 'Guido Cavalcanti e le sue Rime' (1885).

Cavalcaselle, Giovanni Battista, jō vān nē bāt tēs'tā kă-väl-kä-sěl'lā, Italian historian: b. Legnano 22 Jan. 1820; d. Rome November 1897. He became the literary associate of J. A. Crowe (q.v.), with whom he produced the epoch-making 'History of Painting in Italy' (1864-71), the most complete work on the subject; 'Early Flemish Painters' (1857-72); 'Life of Titian' (1877); 'Raphael' (1883).

Cavalier, Jean, zhōñ kă-väl-yā, French soldier, chief leader of the Camisards in the wars of the Cevennes: b. Ribaute, near Anduze, 1681; d. Chelsea, England, 17 May 1740. He was at Geneva when the severe measures of Louis XIV. against the fanatical Camisards induced him to return home. Several insurrec-

CAVALIER—CAVALIER POETS

tions had already broken out, but he soon so distinguished himself by his courage and success, that, though only at the age of 24, he became the acknowledged head of the insurgents. Notwithstanding their gallantry they were obliged to carry on the war on such unequal terms that the impossibility of success became apparent, and Cavalier entered into a capitulation with Marshal Villars, by which he obtained a pension of 1,200 livres, a colonel's commission, and permission to raise a regiment of his own for the king's service. He was summoned, however, to Versailles, and, finding himself looked upon with suspicion, made his escape and soon after visited England. In the Spanish war, being supported by the English and Dutch, he commanded a regiment raised by himself and partly consisting of refugee Camisards, and distinguished himself greatly at the battle of Almanza in 1707, where he was severely wounded. He was afterward pensioned by the British government, appointed governor of Jersey, and made a major-general.

Cavalier, (1) a horse-soldier; an armed horseman; a knight; the name given to the supporters of King Charles I., during the Great Civil war in England, from their gay dress and demeanor, as contrasted with the austerity of the parliamentary party, who were styled Roundheads, from the mode in which the more puritanical of that body wore their hair closely cropped. (2) In fortifications, a kind of interior bastion, several feet more elevated than the principal bastion of the fortress in which it is formed. The use of the cavalier is two-fold: It serves either to defilade the works from the fire of an enemy on an adjacent height, or to command the trenches of the besiegers. Cavaliers are sometimes constructed in the gorges, or on the middle of the curtain, and their form is the semicircular; but when they are within the bastion they are now built with straight faces and flanks parallel to those of the work in which they are placed. French cavaliers are works raised by besiegers on the glacis of a fortress, for the purpose of enabling them to direct a fire of musketry into the covered way.

Cavalier Poets, a term properly applied to the group of lyrists among the followers of Charles I. and of his exiled son, from the first actual warfare with the Commonwealth until the Restoration. The term is also applied more broadly to other poets of the time such as Herrick (q.v.) or Donne (q.v.) who wrote in the same style; but the distinction of the manner is due to those loyalists who were pre-eminently court gentlemen and fighters for the king.

In literary tradition the Cavalier poets took their descent from Wyatt and Surrey, Sidney and Raleigh, and those other cultured and well-traveled "makers" of the Tudor and Elizabethan courts, who naturalized the Provencal lyric and its love-system on English soil. This influence, of course, had been strong in Chaucer's time, but only with this later group did lyric poetry as an accomplishment become well established among the gentlemen around the English sovereign, and take on a native manner, truly expressive of the historical moment.

The early Elizabethan court poets, even in their narrowest imitations of the French son-

neteers, had some of the largeness of the age in their manner; they spoke consciously to an audience. At the end of the reign the Renaissance wealth of scholarship and culture had spread through the nation, in a wide circle from the court. What remained the peculiar inheritance of the courtly poet was undergoing a refinement such as the novel shows in the second part of 'Euphues,' in which the story is taken into the drawing room, where the feminine influence is dominant, imposing in a modern way the exquisiteness which is the end of all courts of love. By a similar transition the courtly poets, letting go the larger subjects and the public manner, made the quality of their verse the very qualities of graceful society—the personal compliment; the brief sallies that general conversation demands; the quick turns in which grace and wit count; that method of society verse which restrains beneath an even manner all feeling that is too personal or too deep. The presence of the ladies is felt—not of one woman alone; as in the garden scene in the second part of 'Euphues,' the lover must find ways to woo his lady under the very eyes of her teasing comrades.

This development of the court poetry was occasioned, no doubt, by the natural growth of culture and the perfecting of manners in English society, as well as at the Court. Some impression, however, was made upon the court by the change from Elizabeth's manlike rule to the gentle influence of Charles' refined queen. The influence of Henrietta Maria, however, was not altogether admirable. Refining though it was, it took the direction of effeminacy, and in the precious fashion which it fostered, of insincere pedantry. William Harbington (1605-1654) in his 'Castara' (1634), illustrates the over-refinement of theme to which the graceful court verse at this moment might have seemed doomed.

The personality of Charles, however, which enlisted the loyalty of the courtiers, his tragic end, and the exile of his family and his followers, gave back to the courtly verse the vitality it was losing, and in addition some new characteristics, which distinguished it as Cavalier poetry. Loyalty to Charles and to his son, unlike loyalty to Elizabeth, was personal more than patriotic; it served to revive therefore some of the most ideal conditions of chivalry. Charles became not so much the sovereign of a country as the head of an order of Knights; his exiled son became their leader under all skies. The sufferings that were the cost of their loyalty, their sense of a lost cause, and the long tradition of proud breeding that would bear all with outward lightness, made the pathos and the grace of the best cavalier poets. The Elizabethan largeness of manner never quite returned, though the Marquis of Montrose (1612-1650) echoed it nobly in his lines on the death of Charles I., and in those on his own execution; but in general the lighter gracefulness continued to be a mark of the Cavaliers, as in Montrose's most famous lyric, 'My dear and only love.' In singleness and loftiness of devotion, in the actual sacrifice of his life for the cause, and in the natural, incidental place of literature in his career, Montrose is perhaps the ideal cavalier poet.

CAVALIERE SERVENTE—CAVALRY

Richard Lovelace (1618-1658), author of the best known cavalier lyric, 'Tell me not, sweet, I am unkind,' and of the only less perfect 'To Althea, From Prison,' illustrates in his life, as does Montrose, the tragedy that often underlay this graceful verse, but the tragedy is here one of sentiment. He impoverished himself to give his fortune to the king. On returning from the wars abroad, he was imprisoned, and his 'Lucasta,' Lucy Sacheverall, believing him dead, married some one else. Lovelace died, worn out by suffering and poverty.

A similarly typical fate was that of Sir John Suckling (1609?-1642), who spent his fortune for the king, became an exile, and died abroad. He wrote several plays, and the clever 'Session of the Poets,' the model of much later criticism in light verse; his fame, however, is founded on his cavalier poems. In his life and in his writing he is neither so noble nor so pathetic as Montrose and Lovelace; he is a roisterer at heart, as can clearly be seen even in the exquisite 'Ballad upon a Wedding.' But he is master of the reckless tone that finally characterized the school, the tone that had been caught so finely by George Wither (1588-1667)—who strangely enough lived to be a Roundhead—in his "Shall I, wasting in despair." In such lines as "Out upon it, I have loved Three whole days together," Suckling turns the bravado note into a pretty compliment; in his best lyric, the song from 'Aglaura'—"Why so pale and wan, fond lover," he carries it to its logical conclusion of recklessness.

Among the numerous poets who wrote in the Cavalier manner, though not under strict Cavalier conditions, besides Herrick and Donne, already noticed, should be mentioned Edmund Waller, for his two perfect lyrics of compliment, 'On a Girdle,' and 'Go, lovely rose.' But far more important is Thomas Carew (1598?-1639?), probably the most gifted minor poet of the time, with the exception of Herrick. He came of good family, enjoyed an excellent education, and, it seems, led a reckless life. In his verse the Cavalier compliment is most elaborate and most noble, as in the incomparable 'Ask me no more,' and in the epitaphs on Lady Mary Villers, where he is indeed more the scholar than the Cavalier. "Give me more love or more disdain," and "He that loves a rosy cheek," are other familiar examples of his felicity. He had in full measure the rhetorical grace of the true Cavalier, the secret of splendid openings and cadences—an unacademic art that began not in literary imitation but in courtly conversation, in the fine compliment paid to beauty that need not be abashed by praise.

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Cavaliere Servente, kä-vä-lē-ār'ē sēr-vēn'tā. See CICISBEO.

Cavalieri, or **Cavalleri**, **Francesco Bonaventura**, frän-chēs'kō bo'nā vān too'rā, Italian mathematician: b. Milan 1598; d. Bologna 3 Dec. 1647. He studied mathematics at Pisa under B. Castelli, a disciple of Galileo, officiated as professor in Bologna, and was author of several mathematical works, the most prominent

of which was entitled 'Geometria Indivisibilium continuorum nova quadam ratione promota.' Having expressed in this work some original ideas concerning the abstruse sciences, the Italians claim him to be the inventor of the infinitesimal calculus.

Caval'la. See KINGFISH.

Cavalli, **Pietro Francesco**, pē-ā'trō frän-chēs'kō kä-väl'lē, Italian composer: b. Crema about 1600; d. Venice 14 Jan. 1676. He began to write operas in 1637, and continued to produce them for 32 years. Among his works are: 'Xerxes'; 'Jason'; and 'Hercules in Love.' He is now believed to be the inventor of the 'Da Capo,' which was generally attributed to Scarlatti.

Cavallo, kä-väl'lō, **Tiberius**, Italian physicist and inventor: b. Naples March 1749; d. London December 1809. He early removed to England, where he published, in 1775, a notice of 'Extraordinary Electricity Observed at Islington.' He invented several ingenious instruments for electrical and chemical experiments. His apparatus for measuring the force and quantity of electricity is remarkably delicate and accurate. In 1779 he was admitted to the Royal Society. His study of the influence of air and light on plant-development was brilliantly original, and paved the way for valuable discoveries in organic life. He wrote: 'Medical Electricity' (1780); 'A Treatise on the Nature and Properties of Air, etc.' (1781); 'Complete Treatise on Electricity' (1786); 'Treatise on Magnetism in Theory and Practice' (1787); 'Elements of Natural and Experimental Philosophy' (1803); and other scientific works.

Caval'ly, one of the popular names of *Caranx hippos*, called also horse-crevallé and jack. It belongs to the family *Carangidæ* (q.v.), and is distinguished by having an enlarged tooth on each side of the tip of the lower jaw, and by having the breast naked.

Cavalotti, **Felice**, fā-iē'chā kä-väl-ōt'tē, Italian statesman and poet: b. Milan 6 Nov. 1842; d. Rome 6 March 1898. He fought under Garibaldi and gained celebrity; was a political journalist. Elected to the Italian parliament (1868), he opposed Crispi and became an extreme Republican. He fought 32 duels, in the last of which he was killed. The most noted of his tragedies are: 'Agnes de Gonzaga'; and 'Alcibiades' (1874). He also published volumes of lyric verse, his best work being 'The Canticle of Canticles.'

Cavalry. Ancient history records many marvelous statements concerning the operations of cavalry. The numbers attributed to the columns of Ghengis Khan and other celebrated raiders seem quite incredible to the modern military student whose ideas are naturally directed to the serious questions of transport and supply. Subsisting mainly upon a species of flour prepared from goat's milk, dried, the idea of a modern commissariat train was not within the range of the wildest dreams of the Tartar hordes, which for centuries roamed over an immense area of Asia and even Europe. Cavalry was used for many centuries before the



2

UNITED STATES CAVALRY EXERCISES.

CAVALRY

Christian era and proved its value in many historic campaigns. Alexander the Great developed his cavalry to a considerable degree of excellence and used it in large bodies with marked success. The Romans made effective use of cavalry, but depended almost entirely upon auxiliaries for recruiting that important branch of their armies. Saddles had not come into use during all this early period of military history and all cavalry then existing must of necessity be classed as light or irregular.

During the Middle Ages, military power was quite generally dependent upon the good will of and exercised through the nobility or chiefs of clans. The use of heavy armor, battle axes, and powerful two-handed swords, demanded strong saddles and large horses. The feudal system was gradually developed and spread over Europe and the British Isles. The fighting was done by the knights and esquires, mounted, while the peasant retainers armed with pikes and crossbows, constituted groups of footmen, who frequently operated in campaigns of considerable duration, but were not armies in the modern sense of the term.

The invention of gunpowder was responsible for a revolution in military methods, and the changes were particularly noticeable in the mounted contingents. The long-continued efforts to make mounted infantry and dragoons efficient while the state of firearms was yet quite primitive, resulted only in discrediting the horsemen. The value of armor was much decreased through the introduction of gunpowder, but its use in some forms continues even in this utilitarian age and generation. The lance has been periodically lauded and discredited. At various times in the world's history it has won high praise through great performance on the field of battle. It has been restored, recently, to full favor in some of the most highly trained and effective armies of modern times, yet no serious test by armies has been made of it since the days of Napoleon. A few charges here and there during a century do not constitute a service test of any weapon. The influence of improvements in weapons is generally seen in modifications of tactics and drill regulations. From this cause may be traced the modification in the orders of battle, which, in various periods of history have required that cavalry should engage in formations ranging from one to six or more ranks in depth. The Americans abandoned the double-rank formation for cavalry as a result of the experience of the Civil War, when nearly 300,000 mounted men, exclusive of mounted infantry, were in the opposing armies. The history of cavalry and its gradual evolution from the hordes of barbarian horsemen of ancient times, down to the modern regiments of lancers or dragoons, covers a vast field which cannot be sketched in a brief essay. The development of the American type of cavalry during the past half century is an interesting and profitable study because of the position now occupied by the United States in the world's affairs.

Until the reorganization of the United States Army in 1901 the proportion of the various arms was always determined through the expediency of the moment rather than upon any well-considered general plan. During the Revolutionary struggle, the early Indian wars, the War of 1812, and, in fact, until the discouragement of con-

stant failure in 1833 to 1836 demanded a change of policy, the mounted service of the army was almost wholly performed by militia or volunteers. The absence of a properly organized contingent of cavalry during the Revolution enabled the young and energetic Tarleton to ride with his small force of dragoons almost at will through the southern Colonies. All the early Indian wars were treated as spasmodic outbreaks demanding temporary application of force, but requiring no provision for the future. The War of 1812 contained much discouragement, but its history records several marked incidents to prove the value of trained troops and the urgent need in a Republic of an organized body to keep alive a knowledge of military art and improvements applicable to warfare. The experience was ignored, however, and it was not until 1821 that a reorganization of the army was undertaken and then the cavalry was left out entirely. During the Black Hawk war a battalion of mounted rangers was called into service and was merged the following year (1833) into the new regiment of mounted troops, the First Dragoons, which constituted the first permanent cavalry regiment of the United States Army. The Second Dragoons was organized in 1836 especially for service in the Seminole war and the valuable services rendered, together with the increasing needs of protection for the Southwestern frontier prevented the disbandment of this fine regiment. These two regiments of dragoons constituted the entire mounted force of a permanent character in service prior to the Mexican war. During this war the regiment of Mounted Rifles was organized and, although it fought as infantry for a time, it was reorganized as a mounted regiment at the close of the war and has continued in service since that time. The acquisition of California and other territory, the discovery of gold, followed by unprecedented immigration through and across the Indian country, demanded a further increase of the army, and in 1855 Congress authorized two regiments, the First and Second Cavalry, which were organized and sent at once to duty upon the Western frontier. Encroachments upon Indian lands and the ever-increasing tide of emigration flowing constantly beyond the border settlements caused incessant conflict with Indian tribes scattered from British Columbia to the Mexican boundary, and from the Missouri River to the Pacific Ocean. With scant necessities and no luxuries in post or field these fine regiments so impressed themselves upon the Indian tribes with whom they came in conflict that the punitive lessons were of untold value when the Civil War caused a general withdrawal of the regular troops from the frontiers. During all the period from their organization until 1861 the regiments had retained their designations of Dragoons, Mounted Rifles, and Cavalry. The drill regulations in vogue during this period were adapted from those in use by the French army and while they now appear somewhat cumbersome, they served well their purpose. These regiments were very efficient mounted organizations and were the schools wherein were trained many of the most successful generals of the Civil War. Their gallantry was attested on many fields in the Florida war, the Mexican war, and upon the great plains of the West. They uncomplainingly endured untold hardships

CAVALRY

by flood and field, especially in the Utah campaign, and fixed a composite type of cavalry upon which all were reorganized in 1861, and which served as a model for the organization of the 272 regiments of cavalry mustered into service during the Civil War.

In 1861 Congress authorized the organization of the Third regiment of cavalry, but immediately after abolished the terms dragoons and mounted rifles, and designated all the regiments as cavalry, giving them numerical designations in the order of their original organization. It was not, however, until 1862 that the old regiments were given the same organization as the new regiment. Prior to this time the regiments were organized on the European model of five squadrons of two troops each. Both the regular and volunteer regiments were organized with 12 troops each and the tactical organization of squadrons of two troops each was continued. The dragoons had secured a high place upon the roll of honor through their gallantry and dash in the Mexican war, and all the regiments had emerged from the period of Indian conflicts with justifiable pride. All experience previous to the Civil War had been limited to meeting emergencies arising in dealing with cunning and relentless savages. A new field of action was now presented when the necessity arose for the organization of larger tactical bodies of cavalry than had ever before been required in this country. Millions were expended in putting into service volunteer cavalry regiments under the prevailing idea that patriotism made invincible soldiers. Much discouragement and an enormous waste of public funds resulted. It was only after a year or two of experience and a thorough weeding out that the Union cavalry became worthy of the reputation which quickly came in the wake of its great successes. The Confederate cavalry was composed entirely of those who could supply their own mounts. This drew to that arm a class of young men accustomed to horseback riding from infancy and usually possessed of a knowledge of fire-arms. This gave them a great advantage over their opponents, which they maintained during all the early period of the Civil War. Inability to supply themselves with remounts, together with the gradual improvement of the Union cavalry brought about a change, and during the last two years of the War the services of the cavalry under Sheridan, Wilson, and other gallant leaders, placed upon the pages of history a continuous record of victories. Operations which became known by the generally accepted title of raids, were conducted by both armies. Legitimate raids, carefully planned and executed with celerity and decision have become recognized as valuable adjuncts of the operations of armies. A large number of so-called raids during the Civil War, on both sides, were demanded by no military necessity, and resulted in excessive losses of horses without corresponding benefits to the general plan of operations.

Throughout the Civil War the question of supplying the cavalry with horses was a very serious one. The waste of animals due to ignorance was great, but the widely extended field of operations, the difficulty of supplying forage, the improper use of cavalry, and the continuous fatigue incident to raids placed strains upon the powers of endurance of the horses which few could withstand.

Deaths due to wounds received in battle constitute but an insignificant part of the losses of cavalry horses in war. It was with a view to both increased economy and efficiency that after a war experience of two years a cavalry bureau was established. An enormous number of horses broken down through excessive marching and fatigue were turned in at the several depots and recuperated sufficiently to be again issued. This was but a fraction of the whole number supplied, owing to the difficulty of returning worn-out horses from distant and isolated points. Some idea of war losses may be had from the statement that there were purchased during the fiscal year ending 30 June 1864, 188,718 horses. During the first eight months the cavalry of the Army of the Potomac was supplied with two complete remounts which required 40,000 horses. The total number of horses and mules required to keep up the supply was 500 a day, and the data collected showed that for every two men of the whole army one animal was required in the ranks or trains. The recent experience of the British army in South Africa indicates that the loss of animals in the Civil War was not exceptional and that whenever campaigns are undertaken in a sparsely settled country history will repeat itself.

The organization, equipment, and methods of employment of cavalry in the Civil War gradually became quite uniform and have since been clearly recognized as the American system. The cavalry was armed with breech-loading magazine carbines, while the infantry continued to the end of the war to use the muzzle-loading rifle. This accounted for the superiority of fire action whenever the cavalry fought dismounted. There was no inclination to avoid mounted fighting with sabre or pistol whenever cavalry was opposed by cavalry on suitable ground, but the most efficient fighting, and that which gave the best results was accomplished by dismounted fire action. The regiments were uniformly armed with breech-loading carbine, pistol, and sabre. The horse equipment consisted of a McClellan saddle-tree covered with rawhide, a saddle blanket, a pair of small saddle-bags, halter and bridle with single rein and curb bit. The arms and equipment have continued to find favor and remain the same in name, but modernized and improved to the highest known standard. There is no stagnation in such matters and experimentation is continually going on with a view to improvement. At the present time (1903) the improved saddle-tree is covered with stuffed russet leather and the saddle-bags are much larger than those formerly used, a change brought about by the necessities of frontier service subsequent to the Civil War. The new carbine will be second to none in the world in the essentials of penetration and trajectory.

The present organization of the cavalry regiments is the same as that adopted in 1862 except that a squadron now comprises four troops instead of two. This makes the number of squadrons in each regiment three, which corresponds with the number of majors and admits of treating the squadron both as an administrative and tactical unit. The number of regular regiments continued at six throughout the Civil War, but was increased to 10 in 1866, because of the requirements of protection for the frontier. As the Indian lands became circumscribed by the settlements, some of the regiments were with-



UNITED STATES CAVALRY EXERCISES.

CAVAN — CAVANILLES

drawn from the frontiers and larger garrisons were established with a view to better instruction. The school of practice which existed during the continuance of Indian hostilities could not well be improved upon as a means of development of self-reliance, woodcraft, and the ability to care for one's self generally in the field. The cessation of savage warfare made it necessary to devise schemes of instruction, having for their object the training of the younger generation of soldiers in campaign duties. Although the American cavalry has not been tested in mounted combat with the cavalry of any of the great military powers of modern Europe, it has proved its efficiency and worth upon many fields. During the Santiago campaign of 1898, in the island of Cuba, owing to insufficient transports, the regular cavalry division participated dismounted. The regiments performed every duty required of the infantry and sustained the reputation for gallantry and efficiency won upon many previous fields of the Civil and Indian wars. The same degree of success has followed the cavalry operations in China and the Philippines. Complete success was lacking in the operations against the Philippine insurgents until a cavalry brigade, provided with pack mules for transportation of rations, was put in the field. It then became possible to follow up the insurgent army, which rapidly fell to pieces and began the guerrilla warfare, which characterized the later days of the insurrection. The continuance of the insurgent warfare, together with the conditions existing in China, made it necessary to reorganize the United States army and by an increase of its personnel to make practicable the release from active service of about 35,000 volunteers who had been enlisted and sent across the seas at great expense.

In undertaking this reorganization, the experience of the past 50 years was carefully studied and many changes introduced, although as a matter both of expediency and compromise many desirable reforms were omitted. Notwithstanding the prevailing political prejudices against modification of the military system, there is no more conservative institution in all America than the regular army of the United States. In determining upon the organization of the cavalry, and of the field artillery also, it was recognized that the organized national guard of the country is composed almost wholly of infantry. The expense of mounted troops is very great and it is quite certain that at the outbreak of war of any magnitude, no reliance could be placed upon volunteer cavalry for mounted action within a less period than one year. Under the last reorganization of the army, a cavalry force of 15 regiments was provided. The American regiment is composed of three squadrons of four troops each, with a minimum number of 65 and a war strength of 100 men to each troop. The European and British cavalry still retain the small squadron of two troops and with four or five squadrons to each regiment. The American cavalry squadron with ranks completely filled to war strength, would be somewhat unwieldy, but the numbers have been fixed as the result of much experience, all of which tends to prove that troops in barracks never march to the field with full ranks, and that after a brief campaign the numbers become still further reduced through weeding out of

unfit men and horses. Every effort is made to perfect the organization and equipment, but some of the most pronounced lessons of the Civil War are still neglected. The recently authorized general staff corps is regarded as the means through which our past and future military experiences will be profitably studied and the results made available for practical application in the regular and volunteer armies, which, under the laws of the country, constitute, in time of war, the "Army of the United States."

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Cav'an, Ireland, a county in the province of Ulster, having Fermanagh on the north, Leitrim on the west, and Longford and Westmeath on the south; area, 746 square miles. In the northwestern part is a range of hills called the Ballymageeragh Mountains, but the remaining surface, which is undulating and irregular, is pervaded by bog and interspersed with many fine lakes. The chief rivers are the Erne, the Woodford, the Blackwater, and the Annalee, and the chief lakes Lough Ramor, Lough Sheelin, Lough Gowna, Lough Oughter, and Upper Lough Erne. Much of the soil of this county is cold, spongy, and inclined to be rushy. The chief cereal crop is oats, the chief green crop potatoes. Wheat is little cultivated; flax is raised to some extent, and the high lands are good for grazing. Linen-bleaching and the distilling of whiskey are the chief industries. The principal towns are Caven, Cootehill, and Belurbet. Pop. (1901) 97,368.

Cavan, Ireland, a town, capital and chief business centre of the above county, 57 miles northwest of Dublin. There are churches for the Episcopalians, Roman Catholics, Methodists, and Presbyterians, an endowed school founded by Charles I., municipal and county offices, jail, union workhouse, a court-house, an infirmary, a fever hospital, and a Roman Catholic college. Pop. 3,000.

Cavanilles, Antonio José, ä-n-tō-nē'ō hō sā' kã-vã-nël'yēs, Spanish clergyman and botanist: b. Valencia 1745; d. Madrid 1804. In 1777 he went to Paris and remained there 12 years, occupied with the study of several sciences, but chiefly with botany. He published there, in 1784, 'Observations on the Article Spain in the New Encyclopedia,' written with as much patriotism as profound reasoning. In the following year he commenced his great botanical work, 'Monadelphix Classis Dissertationes decem' (Paris 1785-9; Madrid 1790, 4to, with engravings). After his return to Spain he wrote 'Icones et Descriptiones Plantarum, quæ aut sponte in Hispania crescunt aut in Hortis hospitantur' (1791-9, 6 vols. folio, with 601 engravings). It contains a number of new genera and species, natives of Spain, America, India, and New Holland. In pursuance of a commission from the king, Cavanilles traveled in Valencia, and collected the materials for his 'Observaciones sobre la Historia Natural, Geografía, Agricultura, Poblacion, etc., del Reyno de Valencia' (1795-7, 2 vols. folio, with copperplates from the drawings of the author). The work was published at the expense of the king, and intended as the first part of a similar work to embrace the whole of Spain. Thunberg has named a family of plants Cavanilla.

CAVATINA — CAVE ANIMALS

Cavatina, kāv-a-tē'nā, in music, a short operatic air without a return or second part, sometimes relieved with recitative, but now extended to the aria generally, especially if the character of expression is tender, hopeful, or joyous. In this elegant and gracefully melodic class of composition the Italians naturally eclipse all other musicians; yet the *Il mio Tesoro* of Mozart will bear comparison with the finest cavatinas ever written.

Cave, Edward, English printer, founder of the 'Gentleman's Magazine': b. Newton, Warwickshire, 27 Feb. 1691; d. London 10 Jan. 1754. His first occupation was that of clerk to a collector of the excise in the country. He then went to London, and put himself apprentice to a printer. When his indentures expired he obtained a place in the post-office, and employed his leisure in writing for the newspapers. He published in January 1731 the first number of the 'Gentleman's Magazine,' which, under a considerably modified form, has continued till this day. Cave was deprived of his place in the post-office on account of his having resisted some abuses relative to the privilege of franking letters. During his last illness Dr. Johnson (who subsequently wrote his life) was often an attendant by his bedside.

Cave, Henry William, English artist and traveler: b. Brackley, Northamptonshire, 1854. He was educated at Queen's College, Oxford, and in 1877 founded the commercial establishment of Cave & Company at Colombo, retiring in 1887. He has published 'Colombo and the Kelani Valley' (1893); 'Kandy and Peradeniya' (1894); 'Nuwara Eliya and Adam's Peak' (1895); 'The Ruined Cities of Ceylon' (1897); 'Golden Tips,' a description of Ceylon' (1900).

Cave, or Cavern, an opening produced by nature in the solid crust of the earth. Caves are principally met with in limestone rocks, in gypsum, sometimes in sandstone, and in volcanic rocks (basalt, lava, tufa, etc.). The form of the caves depends partly upon the nature of the substance in which they exist; but it is frequently altered by external causes. Out of some caverns rivers take their course; others again admit rivers, or may be said to swallow them for a space. There are many and various causes for the formation of caves. Those in limestone and gypsum are unquestionably the results of the dissolving power of water; in fact the almost perfectly uniform direction, the gentle and equable declivity of most caves, appear to be the effect of the long continuance of water in them, the action of which has widened the existing crevices. In trachyte and lava, caves appear to have been produced by the effects of gas. The caves of gypsum often contain foul air; the caves of limestone, various figures of stalactites, produced by the deposit of the lime dissolved in the water. Many of these lime caves contain remnants of bones of animals, such as hyænas, elephants, and bears. See CAVE-DWELLERS.

Many caves are remarkable only on account of their great size, or sublime from the awful gloom which pervades them, and the echoes which roll like thunder through their vaulted passages. Some are of great depth, as that of Frederikshall, Norway, which is calculated to be 11,000 feet in depth. One of the grandest

natural caverns known is Fingal's Cave (q.v.) in Staffa, one of the Western Islands of Scotland. Its sides are formed of ranges of basaltic columns, which are almost as regular as hewn stone. The grotto of Antiparos, on the island of the same name, in the Grecian Archipelago, is celebrated for its magnificence. The roof is adorned with stalactites, many of them 20 feet long, and hung with festoons of various forms and brilliant appearance. In some parts immense columns descend to the floor; others present the appearance of trees and brooks turned to marble. The Peak Cavern in Derbyshire, England, is a celebrated curiosity of this kind. It is nearly half a mile in length; and, at its lowest part, 600 feet below the surface. Other famous stalactitic caves are the Luray Cavern (q.v.), Page County, Va.; one near Matanzas, Cuba; one near Adelsberg, Carniola; the Wyandotte Cave (q.v.), Crawford County, Ind.; and Madison's Cave, in Rockingham County, Va. The caves of Kirkdale, in England, and Gailenreuth, in Germany, are remarkable for the quantities of bones of the elephant, rhinoceros, and hyæna found in them. In the rock of Gibraltar there are a number of stalactitic caverns, of which the principal is St. Michael's Cave, 1,000 feet above the sea. Other celebrated caves in America are Weyer's Cave, in Augusta County, Va., extending 800 yards, but extremely irregular; the Colossal Cavern, Ky. (q.v.), discovered in 1895, and the Mammoth Cave (q.v.) in Edmondson County, Ky., which encloses an extent of about 150 miles of subterraneous windings. One of its chambers, called the Temple, covers a space of nearly five acres, and is surmounted by a dome of solid rock 120 feet in height. The Cumberland Mountains, in Tennessee, contain some curious caverns, in one of which, at a depth of 400 feet, a stream was found with a current sufficiently powerful to turn a mill. Another cave in the same State is named Big Bone Cave, from the bones of the mastodon which have there been discovered. In the Raccoon Mountains, near the northwestern extremity of Georgia, is Nicko-jack Cave, 50 feet high and 100 feet wide, which has been explored to the distance of three miles. A stream of considerable size, which is interrupted by a fall, runs through it. Caves are sometimes found which exhale poisonous vapors. The most remarkable known is the Grotto del Cane, a small cave near Naples. In Iceland and Hawaii there are many caves formed by the lava from volcanoes. In the volcanic country near Rome there are many natural cavities of great extent and coolness, which are sometimes resorted to as a refuge from the heat. In South America is the cavern of Guacharo, which is said to extend for leagues. For information concerning human and animal remains in caves, see CAVE-DWELLERS.

Cave Animals, or Cave Fauna, an assemblage of animals of different classes which are blind and either totally or partially eyeless.

Distribution of Cave-Regions.—In the United States the caves containing permanent inhabitants are situated south of the former region of glaciers, that is, in Mammoth and adjoining caves in Kentucky; Wyandotte and smaller caves in Indiana; caves in Carter County, Ky., and Weyer's and the Luray caverns in Virginia. These regions have been honey-

CAVE ANIMALS

combed by the action of subterranean streams now dried up. With these systems of subterranean drainage are associated sink-holes, and deep, dark wells inhabited by blind fish, crayfish, and other crustaceans of the same species as those inhabiting the caves. Other caves more or less tenanted by blind forms are situated in Mexico, in open sink-holes in Cuba, as well as in caves and wells in New Zealand. Rich cave faunæ are found in southern France, and in limestone deposits near or at the base of the Pyrennes, though the great grotto of Adelsberg, near Trieste, is the classic abode of cavernicolous forms, including the blind triton, eyeless beetles, etc.

Mammoth Cave (q.v.) is the type of a great system of underground passages and chambers where these blind animals live. The total length of its avenues is about 150 miles. In the older and dry passages and chambers there is little life; the animals are mostly found in the newer and damp places, the aquatic forms living in the streams and pools. There is no vegetation except a few scattered molds and fungi. The food is scanty, and the animals are carnivorous, preying on one another. The temperature is very equable, the mean for the winter months being 53° F., and for the summer 54° F. The number of species thus far detected in Mammoth Cave is about 75, and in other American caves about 40 or 50 more, while several hundred kinds exist in European caverns.

Blind Fishes.—The most striking and interesting form in Mammoth Cave is the blind-fish (*Amblyopsis spelæus*). It is about four inches long, colorless, and blind, the eyes being vestigial. This fish seeks the dark and shuns the light, being much disturbed by a lighted match or bright sunlight, or even by a ray of light. In well-fed adult specimens there is no external indication of an eye; but in young ones, before reaching a length of two inches, the eyes can be distinctly seen, owing to their pigment, which is lost in the adult. The optic nerve can be traced in examples under an inch in length, but in large specimens the nerve to the brain cannot be followed. The lens is much reduced, and, in fact, the vestiges of the eyes are exceedingly variable. This will apply to the eyes of other blind fishes and blind insects, crustacea, etc. While the sense of sight is lost, that of touch in the blind-fish, as in most other cave animals, is exalted. *Amblyopsis* is provided with tactile papillæ, arranged in ridges on the front and sides of the head. Though the ears of this blind-fish are said by some authorities to be largely developed, others state that they manifest total indifference to light and sound. They are said to show extreme timidity and caution in their movements.

Blind Salamanders.—A still higher type of vertebrate, two species of salamanders have become adapted to cave life, losing their eyesight by disuse. The species of the genus *Spelerpes* frequent damp, dark situations and the entrances to caves. An allied form (*Typhlotriton spelæus*) is distinctly a cavernicolous as distinguished from a twilight species, and has never been found outside of caves. Its eyes show early stages of degeneration. It inhabits caves in southwestern Missouri, and occurs under rocks in and out of water. Still another salamander, whose eyes are the most degenerate known among amphibians, is the *Typhlomolge*

rathbuni. It lives in subterranean streams, tapped by an artesian and also a surface well, near San Marcos, Texas, and likewise occurs in one of the caves near that town. Its remarkably long and slender legs are too weak to support its body when out of water. The eyes of this salamander are in many respects much more degenerate than those of the *Proteus* of Austrian caves.

The lower animals tell the same story of degeneration, blindness and total or partial atrophy of the eye, together with loss of color, and, in a more striking way, the compensation for the loss of vision by a great increase in length of the antennæ and other appendages, or the growth of long, slender tactile bristles.

Blind Crayfish and Other Crustacea.—The blind crayfish (*Orconectes pellucidus*) is a common cave form. It differs from its out-of-door allies in being blind, slender-bodied and colorless. The eyes are present, but they are much reduced in size, and destitute of a cornea and of black pigment, while the colorless body is slender. It is not only blind, but deaf, and exceedingly timid and cautious in its movements. Other blind or eyeless crustaceans are various kinds of amphipods and isopods, both aquatic and terrestrial, of which species of *Cæcidotea*, allied to the *Asellus*, a common crustacean of fresh waters, are the most abundant, and form the food-supply of the blind crayfish.

Blind Insects.—The eyeless beetles of caves (*Anophthalmi*) have no vestige of eye or of optic nerves and ganglia, while their bodies and appendages are slender. They grope their way about by means of very long tactile bristles. Other beetles, such as *Adelops*, which have retained vestiges of the outer eye; some spiders comprising an eyeless species, and others with eyes varying in size, some much reduced, spin little webs on the walls of the chambers. Among the harvestmen some (*Phalangodes*) have extraordinarily long legs; while the *Cam-podea* (q.v.), a wingless insect of the Mammoth and other caves of the United States and Europe, differs from the outdoor form in its antennæ and abdominal appendages, being greatly exaggerated in length. There are also mites, myriapods, primitive wingless insects (*Podurans*), a few flies, worms, and infusorians.

Origin and History.—The fauna of caves is evidently composed of the descendants of individuals which have been carried by various means into the subterranean passages, have become adapted to life in perpetual darkness, becoming isolated, and thus, as long as they are subjected to their peculiar environment, breed true to their species, and show no tendency to relapse to their originally eyed condition. The absence of the stimulus of light causes the eyes, through disuse, to undergo reduction and atrophy. With this goes, in certain forms, the loss of the optic ganglia and optic nerves. I have found and stated the following effects of disuse in the invertebrate animals of Mammoth and other caves, and from these statements it will be realized how profoundly the organisms have been modified:

1. Total atrophy of optic lobes and optic nerves, with or without the persistence in part of the pigment or retina and the crystalline lens (certain *Crustacea*, harvestmen, *Adelops*, beetle, and the myriapod *Pseudotremia*).

CAVE-BEAR — CAVE-DWELLERS

2. Persistence of the optic lobes and optic nerves, but total atrophy of the rods and cones, retina (pigment), and facets (blind crayfish).

3. Total atrophy of the optic lobes, optic nerves, and all the optic elements, including rods and cones, retina (pigment) and facets (*Anophthalmus* beetle, and the myriapod *Scoterpes*).

An interesting fact, confirmatory of the theory of occasional rapid evolution, as opposed to invariably slow action involved in pure Darwinism, is that we never find any vestiges of the optic lobes or optic nerves; if they are wanting at all, they are totally abolished.

Compensations for Loss of Eyesight.—On the other hand, certain other parts of the body, as the result of use, become extraordinarily developed; such are the tactile papillæ of the blind-fish, the greatly lengthened feelers and legs, the long, delicate tactile hairs of various *Crustacea* and insects. It is plainly the case that the enhanced development of these organs is the result of frequent use of exercise. There is no need of invoking natural selection, these parts developing as the direct result of the change of habits, of the new needs of the animals to feel their way about, forced to adopt such habits by the abnormal conditions of their existence. Although the animals are members of very different groups, inheriting very different structures and habits, yet all genuine cave animals resemble each other in being pale, and ghost-like, in the exaltation of the tactile sense, and the corresponding increase in length and delicacy of the extremities.

Theories of the Origin of Cave Forms.—Darwin attributed the loss of eyes to disuse, stating that natural selection was not operative. Packard stated the view that the loss of eyes was attributable to the Lamarckian facts of change of environment, and consequent disuse, isolation, and use-inheritance. The latest author, Eigenmann, concludes that the Lamarckian view—that through disuse the organ is diminished during the life of the individual, in part at least on account of the diminution of the amount of blood going to a resting organ, and that this effect is transmitted to succeeding generations—not only would theoretically account for unlimited progressive degeneration, but is the only view so far examined that does not on the face of it present serious objections.

An underground laboratory for the study of cave animals has been established by M. Viré in the old catacombs and underground quarries extending under the Jardin des Plantes in Paris. Here are all the conditions of a cave, namely, perpetual darkness, an unvarying temperature, and running water for aquatic forms. M. Viré has introduced various blind and eyed species, and eventually we may expect to have much light thrown on the interesting problems suggested by such studies as these. Great activity has been shown in France in the exploration of the caves and subterranean streams of the Midi; and a Société de Spéléologie has been organized for several years.

Consult: A. S. Packard, 'The Cave Fauna of North America'; 'Memoirs of the National Academy of Sciences' (Vol. VI.); C. H. Eigenmann, 'The Eyes of the Blind Vertebrates of North America' (Archiv Entwicklungsmechanik der Organismen, Vol. VIII.); and other

papers. Consult also the writings of Tellkampff, Schiödte, Cope, Putnam, Garman, Henshaw, Joseph, Chilton, and others.

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Cave-bear, an extinct species of European bear closely allied to the living grizzly, but attaining a larger size. Its remains are found in bone-beds in caverns, whence the name. The habits of the animal were probably not different from those of modern bears. The cave-bear of South America is a different animal. Both species are found in the larger caverns of North and South America.

Cave-dwellers, prehistoric men dwelling in caves, and cave-dwelling animals of corresponding periods; also cave-dwelling men of more recent historic times. Long before the dawn of authentic history, primitive races of men dwelt in large numbers in natural caverns, which were often shaped, enlarged, fortified, or furnished by the occupants. The ages in which the prehistoric cave-dwellers lived are usually called the Palæolithic, or Ancient Stone Age, and the Neolithic, or Later Stone Age. Many caves have been explored in England, France, Belgium, Spain, America, and Australia; notably a famous cave known as Kent's Hole, in Devonshire, England, caves at Brixham and Périgord, and the Madeleine Cave on the Vézère River, France. In the Neolithic Age numerous human skeletons are found, but very few in the earlier age. It is believed that some of these human remains possibly antedate the glacial drift period of Europe. The remains found in the caves are ordinarily overlaid with deposits of varying thickness and different qualities. In Kent's Hole, near Torquay, there were found four distinct strata of deposits overlying the cavern floor: the surface layer a dark earth containing Neolithic and Roman remains, the second layer a thin stalagmite floor, the third a stratum of red earth containing flint implements and bones of animals, and the lowest deposit consisting a hard breccia, in which human and animal remains of a ruder and earlier period were found.

Caves in which the bones of extinct animals are found owe their origin, for the most part, to the action of rain-water on limestone rocks, in which they most frequently occur. The deposit contained in these caverns usually consists of clay, sand, and gravel combined. In this deposit are imbedded remains of animals, and stones either angular or rounded. The bones scarcely ever occur in entire skeletons, but are scattered in such a way as to show that they must have been moved from their places subsequent to the death of the animals. They seldom, however, have suffered much from friction; and at times look so fresh that, but for the complete abstraction of the animal matter which they must have originally contained, they might be supposed to have been brought into the cavern a few weeks before. The most remarkable fact with regard to these bones is that the most of them belong to animals which do not now exist at all, or exist only in regions far remote from those where caverns occur. Some of those found in European caverns belong to animals now found only in the tropical or sub-tropical regions, and others are the re-

CAVE-TEMPLE — CAVEAT

remains of animals now living in more northerly areas, while others, although evidently molded on types similar to those of existing animals, differ from them in several essential features. To add to the difficulty of explanation, human bones have repeatedly been found mingled with those of the lower animals. The evidence of the cave remains proves the co-existence of man with animals not now living in the same areas; of these animals some are now extinct, as the cave-bear (q.v.) and cave-lion, the mammoth, and mastodon, the tichorhine rhinoceros, etc.; others have only migrated. Thus the reindeer is no longer found in southern Europe; the *Hyæna crocuta*, found in the Gibraltar caves, now lives in South Africa. The ibex, the chamois, and a species of ground-squirrel, once lived in the Dordogne, but are now found only on the heights of the Alps and Pyrenees. Thus it is evident that a considerable change of climate has taken place in Europe. Man's relation to these extinct animals, and his existence at the time these changes took place, are demonstrated by the discovery in the caves of human bones and worked flints beneath layers of hyæna droppings, as in Wokey's Hole, near Wells; mixed up indiscriminately, as in Kent's Hole, with bones of elephant, rhinoceros, hyæna, etc.; and by the fact that many bones of the extinct animals are split up, evidently for the sake of the marrow. In the Dordogne and Savigné caves fragments of horn have been found bearing carved—or, rather, deeply scratched—outline figures of ibex, reindeer, and mammoth. The bones of the reindeer are found in large numbers, some of them showing that the flesh had probably been cooked. It is believed that this animal was a chief article of food with the cave-dwellers. Implements of flint and stone are mingled with the remains. Among the non-extinct animals known to have dwelt in the caves with men, or to have been carried there for food, or to furnish their skins for clothing, are the mammoth, musk-ox, horse, dog, bison, rhinoceros, and hyæna. In 1820 Dr. Buckland explored a cave at Kirkdale, in Yorkshire, England, and proved that it had been inhabited by great numbers of hyænas that had dragged into it many other animals. Among the remains found in Europe nothing has been shown to indicate that the cave-dwellers domesticated any animals, or used them for anything but food and clothing. Needles of ivory are found, leading to the inference that they knew how to sew skins together for garments. No traces of agriculture, and no implements used in agriculture, have been discovered. Lance-heads, arrow-heads, hammers, saws made of flint, and harpoons, have been found. The great number of fish-bones found, showing marks of cookery, indicates that they engaged in fishing extensively, but the variety of bird remains indicates their inferior skill in catching or killing winged creatures. They probably had no spinning implements and did not know the art of pottery.

In the cave of Cro-Magnon in the south of France skeletons were found that are accepted by palæontologists as those of genuine cave-men. Taking them as the type, it is inferred that the Palæolithic cave-dwellers were a tall, powerfully built race, with long narrow skulls, broad faces, and powerful jaws. Investigations in the Belgian caves seem to indicate that the cave-men of that region were of much smaller

stature, but with symmetrical, well-shaped bodies. The traces of the most ancient cave-men found in Europe are believed to identify them ethnically with the Esquimau. The bone needles, harpoons, arrow- and spear-heads, and scrapers, are much like those of the Esquimaux. The designs of their carvings also are much the same, as well as their habit of accumulating piles of bones around their dwellings, which they were accustomed to split for the marrow. The habitat of animals now common in the Arctic region, where the Esquimaux live, has shifted to the north, and their migration has been traced with the subsidence of climates, from Europe to the regions where the species that have survived now live. It is believed that the Esquimau in the same way is the descendant of the Palæolithic cave-dweller, who has gradually receded to the north.

The caves belonging to the Neolithic Age yield remains classified into three ages: Neolithic (proper), Bronze, and Iron. They are widely distributed throughout Europe, and contain celts, flints, flakes, rude pottery, bones of the pig, dog, horse, sheep, and goat, with those of many wild animals still indigenous in Europe, and of some that are extinct, and many human skeletons. The latter show that the people populated the caves in great numbers. They were a race of short-statured people having common resemblances in various regions of Europe. They were in some regions cannibals, and slightly in advance of the Palæolithic races in the variety of their implements and occupations. Their gradual progress down to the dawn of history is shown by the substitution of bronze, and then of iron, in place of the stone of earlier ages for implements and weapons.

In America, caves with human remains have been investigated in Brazil, Ohio, Kentucky, Minnesota, Arizona, Colorado, Nevada, Utah, and California. There are remains that have been deposited within the period of authentic history. The conclusions drawn from cave remains, as to the antiquity of man, are subject to the doubts that beset all calculations as to the rate of deposit of geological strata and to the rapidity of changes in climates and zoological characteristics. See MOUND-BUILDERS.

Cave-temple, a cave used as a temple; but the name is especially applied to temples excavated in the solid rock, such as exist in considerable numbers in India.

Caveat, *kā'vē-āt* (Lat. "let him beware") in law, a notice served upon a public officer or court to refrain from doing a certain act without first giving notice to the caveator, as the person is termed who enters the caveat. Perhaps the best-known use of the caveat is its entry by an inventor in the Patent Office for the purpose of establishing his claim to priority of invention, by enjoining its officers from issuing letters patent for any invention interfering with or infringing the rights claimed by the caveator, without first giving him notice of the application for such letters patent. The terms of the caveat must set forth the claims of the inventor and the details of his invention with sufficient particularity to enable the officials of the Patent Office to determine whether a subsequent application for letters falls within the claims of the first inventor. If such is the case the caveator is entitled to notice of such inter-

CAVEAT EMPTOR — CAVENDISH

fering application, and the new applicant's claim to letters is suspended for three months, during which period the caveator must complete his specifications and file his own application for letters patent. If no interfering application is filed, the caveator's rights remain valid for one year, and may be renewed at the end of that term, for one year more, on payment of a second fee. Other uses of the caveat are to prohibit (without notice to the caveator) the admission of a will to probate, the enrollment of a decree in chancery, the grant of letters testamentary to an executor, the issuing of a commission *de lunatico inquirendo*, etc. On the filing of such a caveat and due notice being served thereunder, a hearing is had before a competent tribunal for the determination of the rights in the matter.

Caveat Emptor, a rule of law that warns the purchaser to take care and examine properly before he buys it. In sales of real estate the purchaser's right to relief depends on the covenants in the deed in the absence of fraud on the part of the vendor. In 1 Serg. & R. 42, the rule is stated as follows:

"The rule of *caveat emptor* strictly applies to the purchase of lands, and the consideration-money cannot be recovered back after a deed executed, unless in case of fraud, where some covenant inserted in the deed has been broken. The purchaser has it in his power to protect himself by proper covenants, and there is no reason why the law should provide to him a remedy, where he himself has been wholly inattentive and negligent in this particular."

In sales of personal property the purchaser buys at his own risk, in the absence of an express warranty by the seller, or when the law does not imply a warranty from the circumstances of the sale or the nature of the thing sold, and when the seller was not guilty of a fraudulent misrepresentation or concealment. The purchaser must examine the quality of the goods bought and rely upon his own judgment. Generally, if the article purchased is defective, and an examination, such as a reasonable and prudent man would make, would enable him to see the defect, it is not a fraud on the part of the seller not to call his attention to it.

At common law in the city of London, the law of market overt applied to all stores where articles in that particular line were sold. The purchaser got a good title, but as to the quality the purchaser must examine and judge for himself.

Cavedone, Jacopo, yä'kō-pō kā-vě-dō'nā, Italian painter: b. Sassuolo, in the duchy of Modena, 1577; d. Bologna 1660. He was a pupil of Annibale Carracci. His best works are the 'St. Alo,' in the church of the Mendicanti at Bologna, the 'Adoration of the Magi,' the 'Four Doctors,' and the 'Last Supper.' Out of Italy he is frequently mistaken for Annibale Carracci.

Ca'ven, William, Canadian educator: b. Kirkcolm, Scotland, 26 Dec. 1830; d. Toronto, Canada, 1 Dec. 1904. He went to Canada with his father in 1847, studied theology at London, Ont., was ordained minister of the United Presbyterian Church, 1852, and was pastor of St. Mary's and Downie, 1852-65. In 1866 he became professor of exegetical theology and biblical criticism in Knox College, Toronto, and principal in 1873, having been chairman of the college board since 1870. He was a pro-

moter of the union of the Canadian Presbyterian churches, moderator of the Church in 1875, and president of the Ontario Teachers' Association, 1877.

Cavendish, kāv'ēn-dīsh or kǎn'dīsh, Frederick Charles, LORD, second son of the 7th Duke of Devonshire, English statesman: b. Eastbourne 30 Nov. 1836; d. 6 May 1882. He sat in Parliament as Liberal member for the north division of the West Riding of Yorkshire from 1865 till the spring of 1882, when he succeeded Mr. Forster as chief secretary for Ireland. On the evening of 6 May, he and Mr. Burke, an unpopular subordinate, were stabbed to death in the Phoenix Park. Eight months later, 20 "Irish Invincibles" were tried for the murder, and, Carey and two others having turned queen's evidence, five of the rest were hanged, three sentenced to penal servitude for life, and the remaining nine to various terms of imprisonment. Carey himself disappeared; but in July news came from the Cape that he had been shot dead by an Irishman named O'Donnell on board an emigrant ship. O'Donnell was taken back to London and hanged.

Cavendish, George, English biographer: b. about 1500; d. about 1561. He became Wolsey's gentleman-usher at least as early as 1527. He remained in close attendance upon his great master till the latter's death, 28 Nov. 1530, after which he retired to his house at Glemsford, in Suffolk, where he lived quietly with his wife, a niece of Sir Thomas More, till the close of his own life. His affection for the great cardinal was most devoted, and his 'Life of Cardinal Wolsey' is one of the most interesting short biographies in the English language.

Cavendish, Henry, English chemist: b. Nice, Italy, 10 Oct. 1731; d. London 10 March 1810. He was a grandson of the second Duke of Devonshire, and after his education at Peterhouse College, Cambridge, devoted himself exclusively to scientific research. He discovered the peculiar properties of hydrogen, and the qualities by which it is distinguished from atmospheric air. To him we owe the important discovery of the composition of water. Scheele had already observed that, when oxygen is mixed with double the quantity of hydrogen, this mixture burns with an explosion without any visible residuum. Cavendish repeated this experiment with the accuracy for which he was distinguished. He confined both the gases in dry earthen vessels, to prevent the escape of the product of their combustion, and found that this residuum was water, the weight of which was equal to the sum of the weights of the two gases. Lavoisier confirmed this conclusion in later times. Cavendish possessed a profound knowledge of the higher geometry, of which he made a very happy use in determining the mean density of the earth. He found it to be five and a third times greater than the density of water — a conclusion which differs but little from that obtained by Maskelyne in another way. Coulomb investigated the law of attraction between two electrified points directly by means of the torsion balance. Cavendish was, however, the author of the far more exact method of proving the law, which he expressed in the following syllogistic form. He demonstrates mathematically that, if the law of force be any other than the inverse square of the distance, electricity

CAVENDISH — CAVITE

could not rest in equilibrium *at the surface* of a conductor. But experiment has shown that electricity does rest in equilibrium on the surface of a conductor. Hence the law of force must be the inverse square of the distance. He himself made excellent experiments in order to support his minor premise. He did not, however, consider that his experiments justified him in holding the truth of it as thoroughly established, though he believed it to be true. Since his time the experimental researches of Faraday and others have completely demonstrated the truth of it, and therefore of the law above stated. Cavendish was a member of the Royal Society of London, and in 1803 was made one of the eight foreign members of the National Institute of France. His writings consist of treatises in the 'Philosophical Transactions,' from 1766 to 1792. They are distinguished by acuteness and accuracy.

Cavendish, Margaret, DUCHESS OF NEWCASTLE, English writer: b. Essex 1624 (?); d. 1674. She wrote 'Philosophical Fancies'; a collection of poems, 'The Pastime and Recreation of the Queen of Fairies'; 'Philosophical Letters' (1664).

Cavendish, or Candish, SIR THOMAS, English navigator: b. Trimley Saint Martin, Suffolk, about 1555; d. at sea off Ascension Island, 1592. Having consumed his property by his early extravagances, he collected three small vessels for the purpose of making a predatory voyage to the Spanish colonies. He sailed from Plymouth in 1586, took and destroyed many vessels, ravaged the coasts of Chile, Peru, and New Spain, and returned by the Cape of Good Hope, having circumnavigated the globe in two years and 49 days, the shortest period in which it had then been effected. For this exploit he was knighted by the queen. In 1591 he set sail on a similar expedition, in which his principal success was the capture of the town of Santos, in Brazil.

Cavendish, William, Duke of Newcastle, English general: b. 1592; d. 25 Dec. 1676. On the approach of hostilities between the Crown and Parliament he embraced the royal cause, and was invested with a commission constituting him general of all his majesty's forces raised north of the Trent, with very ample powers. Through great exertions, and the expenditure of large sums from his private fortune, he levied a considerable army, with which, for some time, he maintained the king's cause in the north. In military matters he depended chiefly on his principal officers, it is said, but the numerous successes obtained by him render this unlikely. In 1643 he obtained a complete victory over Lord Fairfax on Adwalton Moor, and recovered all Yorkshire except Hull; but next year, on the arrival of the Scottish army and its junction with the parliamentary forces, threw himself into York. Having been relieved by Prince Rupert, he was present at the battle of Marston Moor next day, after which he left the kingdom. His term of exile was chiefly spent in Antwerp, where he was for a time so straitened in circumstances that he had on one occasion to pawn his wife's jewels. He returned, after an absence of 18 years, and was rewarded for his services and sufferings with the dignity of duke. His works include 'La Methode et Invention Nouvelle de dresser les Chevaux' (Antwerp 1657); 'A New Method and Extraordinary

Invention to Dress Horses, and Work Them According to Nature' (1667); some comedies of no merit; and several worthless poems.

Cavendish, William, English statesman: b. 25 Jan. 1640; d. 18 Aug. 1707. He was first Duke of Devonshire, was the son of William, third Earl of Devonshire, and was instructed with great care in classical literature. On various occasions he distinguished himself by his spirit and valor, and in 1677 began that opposition to the arbitrary measures of the ministers of Charles II. which caused him to be regarded as one of the most determined friends of the liberties of his country. Intimately connected with Lord Russell, he joined him in his efforts for the security of free government and the Protestant religion. On the trial of Lord Russell he appeared as a witness in his favor, and offered to assist him in escaping, after he had been sentenced to death, by changing clothes with him in prison. In 1684, having succeeded to his father's title, and being regarded as one of the most formidable opponents of the arbitrary designs of King James II., attempts were made to intimidate him, but without success. He took an active part in promoting the revolution, and was one of the first who declared for the Prince of Orange. His services were rewarded with the dignity of Duke of Devonshire. He still, however, maintained an independent bearing in Parliament during the remaining years of his life.

Cav'endish, tobacco which has been softened and pressed into quadrangular cakes, so called after Thomas Cavendish, the Elizabethan circumnavigator.

Cavendish Experiment. See GRAVITATION.

Ca'verypauk, India, a town of Hindustan, in the North Arcot division of Madras Presidency, 57 miles west-southwest of Madras. It is meanly built, and the adjoining fort, at one time a place of some strength, is now in ruins. A victory was gained here by the British under Clive over the French and their allies in 1752. Near the town is an immense artificial pond, eight miles long by three miles broad, by means of which a large tract of country is irrigated. It is perhaps the finest work of the kind in South India. Pop. 7,000.

Caviana, kã-vē-ã'nã, Brazil, an island 35 miles long and 20 miles wide. It lies in the north mouth of the Amazon, under the equator; is level, fertile, and well stocked with cattle. The small town of Roberdello is on its southeastern side.

Caviare, kãv-ï-är', a table delicacy prepared from the roe of the sturgeon, *Acipenser sturio* or *A. huso*. It is made in great quantities in Russia, especially at Astrakhan, where great quantities of sturgeon are caught in the Volga, and of late years the industry has developed in some of the western States of America. The roe is separated from the skin which encloses it, washed in vinegar, and dried in the sun. A quantity of salt is then rubbed in by hand, and the roe is put into a cloth and pressed to remove the liquor, after which it is packed in small kegs for the market.

Cavite, kã-vē'tã, Philippines, a province in the southwestern part of the island of Luzon, bounded on the north and northwest by Manila Bay, on the north and northeast by the province

CAVITE — CAVY

of Manila, and on the south by Batangas; area, 510 square miles, with the dependent islands, 610 square miles. In the south and southwest the province is mountainous; in the northwest there is a gradual elevation, forming a fertile plateau. The chief products are coffee, sugar, fruits, and rice (in the lowland regions). In the towns of the interior, hemp and cotton cloth, and sugar are manufactured; in the coast towns the chief industries are salt manufacture and fishing. There is export trade in all these products. There is communication with Manila by water and good roads throughout the province, connecting the coast with the interior. The occupation of Cavite by United States troops was the first event of importance in the Philippines after the naval battle in Manila Bay, 1 May 1898. The government of the province was established under the provincial government act of 6 Feb. 1901; and later several of the dependent islands were added to the territory in Luzon. Pop. 134,500.

Cavite, Philippines, a town and capital of the province of Cavite, on the eastern shore of Manila Bay. A tongue of land about one and a quarter miles long, projecting due east, separates waters of Cañacao Bay on the north, and Bacoor Bay, inner harbor of Cavite, on the south. On this projection are situated fortifications and arsenal. The town is walled, and all the buildings are of stone; it has a parochial church, two convents, and a hospital. It has also several manufacturing industries, and is well equipped for building and repairing vessels. The Spanish fleet had its position off Cavite when attacked by Admiral Dewey on 1 May 1898. The town is the naval headquarters of the United States in the Philippines. Pop. 3,000.

Cavo Relievo, **Sculpture in**; called also **Coelanaglyphic** and **Concavo-convex Sculpture**, a system of relief in which the figures do not rise above the general surface of the stone, ivory or other material on which the carving is done. It may be looked upon as sculpture in relief, of which the background has not been cleared away in the usual manner. Again, it may be considered as sculpture of which the bounding line has been marked by a groove, generally wedge-shaped, that is with a section like a V: the slope of one side being left as the boundary of the pattern or design, while the other slope disappears in the general rounding of the figures. This sculpture, in architectural art, is almost confined to the Egyptian buildings of times before the Roman domination; but in minor decorative arts the Orientals do beautiful work in this way.

Cavour, *kä-voor'*, **Camillo Benso**, **COUNT DI**, Italian statesman: b. Turin 10 Aug. 1810; d. 6 June 1861. He was educated in the military academy at Turin, and after completing his studies he made a journey to England, where he made himself acquainted with the principles and working of the constitution. In 1842 he returned to Turin, where shortly afterward he published in the 'Bibliothèque Universelle' of Geneva his 'Considerations on the Present State and Future Prospects of Ireland,' which were subsequently translated into English. With Count Balbo and others he established in 1847 the journal of the 'Risorgimento.' It was not, however, till after the battle of Novara that he entered that political arena in which his name has since become so famous.

He became a member of the Sardinian Chamber of Deputies in 1849, and the following year succeeded Santa Rosa as minister of commerce and agriculture. In this office he set himself strenuously to promote the internal prosperity of the country by the establishment of railways and an improved system of postal communications. A new organization was given to the military and naval forces; and the monasteries were, with certain exceptions, suppressed. In November 1852 Cavour became premier, and not long afterward gave a signal proof of his statesmanship by the part which he took in cementing an alliance with Great Britain and France, and making common cause with these powers against the aggressions of Russia. The prestige thus gained to the arms of Sardinia was no less important than that acquired by her liberal and reforming policy in civil matters. The attitude, however, thus taken by Sardinia could not fail to prove extremely offensive to the neighboring power of Austria, to whose arbitrary and repressive measures the government of Victor Emmanuel displayed itself as a standing reproof, and whose supremacy in Italy was eminently jeopardized by the aspirations of Sardinia. A collision, therefore, was inevitable, resulting in the campaign of 1859. The intimate connection formed at that time with France, who lent her powerful assistance in the prosecution of the war, was mainly due to the agency of Cavour, who was accused by some on this occasion of having purchased the assistance of Louis Napoleon by unduly countenancing his ambitious projects. The marriage of Victor Emmanuel's daughter, the Princess Clotilde, with Prince Napoleon, was consummated in the early part of 1859, and the conclusion of the same year witnessed the cession of Nice and Savoy to France. In bringing about both of these results Cavour took a leading part. In 1860 Garibaldi's expedition to Sicily took place; but toward this and the subsequent movements of the Italian liberator, Count Cavour manifested an apparent coldness, which diminished somewhat his estimation in the minds of the more zealous Italian patriots. See Romilly, 'Reminiscences of the Life of Cavour' (1863); Dicey, 'Cavour: a Memoir'; Bianchi, 'La Politique de Cavour' (1885); 'Lives' by Massari (1873); Mazade (1877); Martinengo-Caesaresco (1897).

Cavy, *kä'vī*, a small rodent of the family *Caviidae*, related to the paca and aguti, and characterized by its stout build, short legs, small ears, pink eyes, and total absence of a tail. Cavies are semi-nocturnal animals; feed upon roots and vegetable fare, and are widely distributed throughout the plains and unforested highlands of South America. The only domesticated and familiar species is the much modified guinea-pig (*q.v.*), which is about eight inches long, and owing to its harmlessness, is a great household pet among children. The largest species of cavy (*C. patchonica*), wrongly called "agouti," is scantily distributed throughout the plains of Argentina. It is rusty red in color, and about the size of a hare, standing on terrier-like legs. The "restless" cavy (*C. porcellus*), and Cutler's cavy (*C. cutleri*), are common in the La Plata valley, and are uniformly colored with grayish-brown or black. Other species are found in Brazil and Bolivia.

CAWDOR — CAXTON

Cavies live in burrows of their own digging, and breed twice a year, the number of young varying with the climate. The young are brought forth in a very advanced state of development. Their eyes are open and they are capable of running by the side of their mother in a few hours' time. In less than a fortnight they are quite able to care for themselves. Consult: Hudson, 'Naturalist in La Plata'; and Lydekker, 'Standard Natural History.'

Cawdor, kô'dër, Scotland, a village in Nairnshire, 5½ miles southwest of Nairn. Cawdor Castle, near by, the seat of the Earl of Cawdor, was founded in 1454, but is one of the three places which tradition has assigned as the scene of King Duncan's murder by Macbeth in 1040. A series of papers from the charter-room at Cawdor was edited (1859) by Cosmos Innes under the title of 'The Book of the Thaness of Cawdor.'

Cawdor, Thane of, in Shakespeare's 'Macbeth,' a character who does not appear upon the stage. On account of his alliance with the Northmen he is condemned to death by Duncan, who calls him "that most disloyal traitor." His title is given to Macbeth, in accordance with the prophecy of the witches. In describing his death it is thought that Shakespeare had reference to the execution of the Earl of Essex.

Cawein, kaw'ën, **Madison Julius**, American poet: b. Louisville, Ky., 23 March 1865. His verse is often exceedingly musical and displays great command of metres. Its defects are over ornamentation, and a too profuse employment of adjectives, but the note which he strikes is distinctive and pleasing. He is at his best in his purely Kentuckian poems. His works include: 'Blooms of the Berry' (1887); 'The Triumph of Music' (1888); 'Accolon of Gaul' (1889); 'Lyrics and Idyls' (1890); 'Days and Dreams' (1891); 'Moods and Memories' (1892); 'Intimations of the Beautiful' (1894); 'Poems of Nature and Love' (1893); 'Red Leaves and Roses' (1893); 'Undertones' (1895); 'The Garden of Dreams' (1896); 'Shapes and Shadows' (1898); 'Idyllic Monologues' (1898); 'Myth and Romance' (1899); 'One Day and Another' (1901); 'Weeds by the Wall' (1902).

Cawnpore, kôn-pôr, or **Cawnpur**, kôn-poor', India, capital city of the district of the same name, in the Northwest Provinces, on the right bank of the Ganges, which is here about a mile wide, 130 miles northwest from Allahabad. It is a modern town with nothing specially noteworthy about it as regards site or buildings. There are several churches, a theatre, various military and other offices, high school, club, etc. It manufactures leather and cotton goods, has a large trade, and is an important railway centre. In 1857 the native regiments stationed here mutinied and marched off, placing themselves under the command of the Rajah of Bithur, the notorious Nana Sahib. Gen. Wheeler, the commander of the European forces, defended his position for some days with great gallantry, but, pressed by famine and loss of men, was at length induced to surrender to the rebels on condition of his party being allowed to quit the place uninjured. This was agreed to; but after the Euro-

pean troops, with the women and children, had been embarked in boats on the Ganges, they were treacherously fired on by the rebels; many were killed, and the remainder conveyed back to the city, where the men were massacred and the women and children placed in confinement. The approach of Gen. Havelock to Cawnpore roused the brutal instincts of the Nana, and he ordered his prisoners to be slaughtered, and their bodies to be thrown into a well. The following day he was obliged, by the victorious progress of Havelock, to retreat to Bithur. A memorial has since been erected over the well in the form of an angel with palm branches, and fine public gardens, covering 50 acres, now surround the spot. Including the native city, cantonments, and civil station, it had in 1901 a population of about 197,000.

Caxamarca. See CAJAMARCA.

Caxias, kâ-shê-äs', the name of two places in Brazil: (1) A town in the state of Maranhão, on the navigable Itapicuru, 190 miles from its mouth, with an active trade in cotton. Pop. 10,000. (2) An Italian agricultural colony in the Brazilian state of Rio Grande do Sul, founded in 1875. Pop. 13,680.

Caxton, William, first English printer: b. Kent about 1422; d. London 1491. In 1438 he was bound apprentice to Robert Large, a mercer in London, and soon after his master's death (1441) he went to Bruges, where, in 1446, he went into business on his own account. About 1463 he was appointed "governor" at Bruges for the English merchants settled in the Low Countries, a post in which he continued for some years. About 1471 Caxton entered the service of Margaret, Duchess of Burgundy, sister of Edward IV. He had already begun a translation of the popular romance entitled 'Le Recueil des Histoires de Troye,' and this he finished at Cologne in 1471. In order to meet the demand for the book he learned the art of printing, probably at Cologne, and his 'Recuyell of the Histories of Troy,' the first English printed book, appeared about 1474, having issued, it is supposed, from the press of Colard Mansion at Bruges. His 'Game and Playe of the Chesse,' also a translation from the French, was probably a production of the same press in 1475, and is the second English book printed. He left Bruges in 1476, returned to England, and in 1477 had a press at Westminster Abbey, where he printed the 'Dictes and Sayings of the Philosophers,' the first typographical work executed in England. Caxton continued to exercise his art for about 14 years, during which time he produced nearly 80 works, many of them translated by himself from the French, and one of them — 'Reynard the Fox' — from the Dutch. He was patronized by Edward IV., Richard III., and Henry VII.; and he was on intimate terms with Earl Rivers, the Earl of Worcester, and others of the nobility, the two noblemen named having even translated works for his press. He was buried in the Church of St. Margaret's, Westminster. Besides the books already mentioned, Caxton printed Chaucer's 'Canterbury Tales'; 'Troilus and Creside'; 'Book of Fame,' and translation of Boethius; Gower's 'Confessio Amantis'; works by Lydgate; Malory's 'King Arthur'; 'The Golden Legend'; 'The Fables of Æsop,' etc. His books have

no title pages, but are frequently provided with prologues and colophons. His types are in the Gothic character, and copied so closely from the handwriting of his time that many of his books have been mistaken for manuscript. In some no punctuation is used; in others the full point and colon only; commas are represented by a long or short upright line. Copies of some of his books now bring extraordinary prices when sold. The standard 'Life of Caxton' is that by W. Blades (1861-3).

Caxtons, The, a novel by Edward Bulwer, Lord Lytton, published in 1850. 'The Caxtons' was not only instantly popular in England, but 35,000 copies were sold in America within three years after its publication in 1850. Never before had Bulwer written with so light a touch and so gentle a humor, and this novel has been called the most brilliant and attractive of his productions. His gentle satire of certain phases of political life was founded, doubtless, on actual experience.

Cayambe'-Urcu, *kä-yäm-bā'-oor'koo*, or **Cayambe'**, a summit of the Colombian Andes, lying directly under the equator in Ecuador. It rises in the shape of a beautiful and regular cone to a height of 19,187 feet. Its top is crowned with perpetual snow, and its geographical position and great elevation render it one of the most remarkable mountains of the world.

Cayenne, *kā-yěn'* or *kī-ěn'*, French Guiana, a city and capital of the colony, situated in lat. $4^{\circ} 56'$ N., lon. $52^{\circ} 20'$ W. The first casual occupants were the Dutch, at the beginning of the 17th century. The French, under Charles Poncet, settling here, as well as at other points on the Guiana coast, 20 years later, were driven out by the natives, but undertook another expedition in 1643. Again unsuccessful, they made a third futile effort in 1652; then they deserted the town. The Dutch re-occupied it, but were obliged to surrender possession to a new French expedition. After the Treaty of Breda the Dutch once more took Cayenne, and were attacked there by the French in 1676. The French settlement was permanently established at the beginning of the 18th century. Present population, about 10,000, of whom more than half are convicts, including the negroes, Anamites, and Arabs, transported for crimes committed in the French, African and Asiatic colonies. White criminals have in recent years been sent elsewhere, as a rule, but Alfred Dreyfus, captain in the French army, after his conviction of treason in December 1894, was condemned to solitary confinement on the Ile du Diable, a remote outpost of the Cayenne penal settlement (27 miles away, off the northwest coast), and there remained until taken back to France for a new trial. The climate of the capital, which is built on an island east of the mouth of the Cayenne River, is rendered exceedingly unwholesome by the low and swampy character of a part of the neighboring coast. The harbor is shallow, yet the products of the country—gold, sugar, molasses, rum, coffee, hides, spices, cocoa, etc.—are shipped in considerable quantities each year. The recent discovery of diamonds (1900-3) in the interior of the Guianas suggests a possible development of trade, and a better use of American territory in the future. See GUIANA.

Cayenne Pepper, or **Capsicum**, a powder formed of the dried and ground fruits, and more especially the seeds, of various species of *Capsicum*, and especially of *C. frutescens*. It is employed as a condiment to improve the flavor of food, aid digestion, and prevent flatulence. In medicine it is used as a stimulant, and is a valuable gargle for a relaxed throat. See CAPSICUM.

Cayes, kā, Les. See AUX CAYES.

Cayley, kā'lī, Arthur, English mathematician: b. Richmond, Surrey, 16 Aug. 1821; d. London 26 Jan. 1895. He received his early education at Blackheath and King's College, London, passing subsequently to Trinity College, Cambridge. Called to the bar in 1849, he practised for some years as a conveyancer, but in 1863 was appointed first Sadlerian professor of pure mathematics at Cambridge. Trinity College in 1875 accorded him the rare honor of electing him a Foundation Fellow. He received many distinctions from universities and learned societies both at home and abroad, and in 1883 he presided over the meeting of the British Association at Southport. He seldom identified himself with movements outside his own immediate work, but took a prominent part in the agitation for the higher education of women, which resulted in the foundation of Newnham College. As a mathematician he was characterized by the wide scope and originality of his work. His chief memoirs deal with differential equations, elliptic functions, and determinants. His 'Elementary Treatise on Elliptic Functions' appeared in 1876, and 'Single and Double Theta-functions' in 1881; and in 1889, a collected edition of his papers began to be issued, extending over a number of volumes. In 1882 he lectured in Johns Hopkins University, Baltimore.

Cayley, SIR George, English scientist: b. Brompton, Yorkshire, 1773; d. 15 Dec. 1857. His genius first displayed itself in the analysis of the mechanical properties of air under chemical and physical action. His papers on the subject gave rise to many experiments on the navigation of balloons at home and abroad. His experiments on the steam engine led to his invention of the air engine. His discoveries in optics were followed by the invention of an instrument for testing the purity of water by the abstraction of light. He was also the inventor of an ingenious arrangement for obtaining and applying electric power to machinery. He was one of the original promoters of the polytechnic institution at London. Toward the end of the 19th century he applied to his extensive estates in Yorkshire a new system of arterial drainage. He was also the father of the cottage allotment system. As a politician, he took a prominent part in the election of liberal members of Parliament, and the return of Brougham was chiefly due to his sympathy with the reform bill. Upon the passing of that bill he was himself chosen as member for Scarborough, but on account of his advanced age, soon retired.

Cayleyan, *kā'lē-an*, in mathematics, the name for a family of curves investigated by Prof. Cayley, of Cambridge, and by him called *pipians*. The Cayleyan is of the sixth order, and is exhibited as the envelope of right lines, considered in couples, which are polar conics of the general curve of the third order. In Cayley's

notation, if the cubic is $U = (*) (x, y, z)^3 = 0$ then $P U = 0$ is the Cayleyan. See Cayley, 'Collected Mathematical Papers,' Vol. I., p. 183, and Vol. II., p. 381.

Caylus, Anne Claude Philippe de Tubières, än klōd fē-lēp dē tü-bē-ār kā-lūs, COUNT OF, French archæologist: b. Paris 31 Oct. 1692; d. there 5 Sept. 1765. He was a son of the Marquise de Caylus (q.v.), and after having served in the army during the war of the Spanish succession, he left the service in 1715, accompanied Bonac on his embassy to Constantinople the following year, and visited Greece, Troy, Ephesus, Byzantium, and Adrianople. In 1717 he returned to Paris, and began the arrangement of his extensive collections. He commenced a great work on Egyptian, Grecian, Etruscan, Roman, and Gallic antiquities, with numerous plates. He was a member of the Academy of Painting and of the Academy of Inscriptions, and divided his labors between them. He made a chemical examination of the ancient method of encaustic painting, investigated the mode of painting on marble, the art of hardening copper, the mode by which the Egyptians raised great weights, the mummies, painting on wax, and many other subjects. Integrity, simplicity, and disinterestedness were united in his character, with occasional traits of dogmatism. He has left numerous works, tales as well as antiquarian researches. Among the latter is his 'Recueil d'Antiquités Égyptiennes' (1752-67, 7 vols.). Caylus was also an industrious and skilful engraver, and produced a collection of more than 200 engravings, after drawings in the royal cabinet, and a great number of heads, after the first masters.

Caylus, Marthe Marguerite de Villette, mār-tē mār gēr ēt dē vėl-ēt, MARQUISE DE, French writer of memoirs: b. Poitou 1673; d. Paris (?) 15 April 1729. Long an ornament of the brilliant court of Louis XIV., she passed her declining years in dictating 'My Recollections,' in which a valuable insight into the life of Louis XIV. is afforded, through the medium of a singularly happy style.

Cayman, kā-măn, or Caiman, kā-ē'măn, any of five species of alligators inhabiting the fresh waters of Central and South America. The caymans are distinguished from other alligators in having an armor of overlapping bony scutes protecting the belly, as well as an armor of bony plates on the back. The black cayman (*Caiman niger*) of tropical South America east of the Andes is the largest species, reaching a length of 13 feet. In some of the rivers of South America caymans are found in vast numbers and are said to be extremely voracious.

Cay'mans, The, or Cayman Islands, three islands situated in the Caribbean Sea, about 140 miles northwest of Jamaica, of which they are dependencies. Grand Cayman, the largest of the three, is 17 miles long, and from 4 to 7 broad. It is well wooded. The natives are chiefly employed in agricultural operations or in trading with Jamaica and other places. They cultivate sugarcane and vegetables, and raise cattle, pigs, poultry, etc. Turtle and cocoa-nuts are exported. The climate is very healthful. There are several Presbyterian places of worship. A large proportion of the inhabitants are whites. Pop. about 2,500. Cayman Brac has about 500 inhab-

itants, mostly white, Little Cayman, 40 or 50, all white.

Cayuga (ka-yoo'gä) Lake, a lake in the State of New York, on the boundary of Cayuga and Seneca counties, and extending south into Tompkins County, 38 miles long and from 1 to 3½ miles wide. It is much frequented by pleasure parties. The town of Ithaca stands at the southern extremity of the lake.

Cayu'gas ("swamp-dwellers," possibly in reference to their cranberry swamps) a tribe of North American Indians, forming the smallest of the original Five Nations of the Iroquois, and according to Onondaga tradition, the last to join the confederacy; whence it was called "The Youngest Brother." The tribe was not inferior in energy and original genius, however; several of the chiefs were men of superior ability, as Karistagea, or Steeltrap; and Tahgahjute, or "Logan," the son of one of its sachems. The latter will be ever remembered, not only for the pathetic speech attributed to him, but for his high personal qualities. Nor were the Cayugas inferior in fighting prowess: in one of their Virginia campaigns they seem to have destroyed the tribe of Tuteloes, and incorporated with their own tribe the remnant who were not slain. They were friendly to the whites, however, and bore a good reputation. They were located along the Cayuga Lake in central New York, and in the valley of its outlet, the Seneca River. At the outbreak of the Revolution, they joined the Mohawks and Senecas in alliance with the British against the Americans, and shared in the devastation of the property of the patriots during Sullivan's campaign; the most of them settled in Canada with the other Iroquois, 200 remaining in New York, apparently around Niagara. In 1789 they made their first formal cession of territory to the whites, confirming it by a treaty at Fort Stanwix in 1790; in 1795, by a treaty at Cayuga Bridge, they ceded their great reserve in the lake basin and the river valley, retaining only one of four miles square. For these releases they received large money annuities, which they used largely for liquor. In 1806 all the remainder left the reservation and emigrated westward or northward; some joining their brethren in Canada, some going to Sandusky, Ohio, others settling among the Senecas near Buffalo. There are at present about 1,300 in all, the bulk of them at the Six Nations on Grand River, Ontario, some with the Oneidas in Wisconsin, about 170 with the Senecas in New York State, and others with the Senecas in Indian Territory.

Cayuse, kā-yoos', Cailloux, or Willetpoo, a tribe of North American Indians who formerly inhabited the region between the Des Chutes River and the Blue Mountains, Oregon, and also parts of Washington, south of the Yakima River. There are now only about 415 persons, presumably of Cayuse blood, on the Umatilla reservation.

Cay'van, Georgia, American actress: b. Bath, Maine, 1858; d. 19 Nov. 1906. She went on the stage early in life and won note as Dolly Dutton in 'Hazel Kirke.' She was afterward with A. M. Palmer and Daniel Frohman. She became leading lady of the Lyceum Theatre Stock Company in 1897, retiring from the stage soon afterward.

Cay'zer, Charles William (CHARLES WHITWORTH WYNNE), English shipowner and poet: b. Bombay 19 July 1869. He was educated at Rugby and Christ Church, Oxford, and has published 'Ad Astra' (1900), a very extensively advertised volume; 'Songs and Lyrics' (1900); 'King David' (1902).

Cazal, Manuel Ayres de, mā'noo-əl ī'rēz dā kā-zāl', Portuguese historian: b. 1754; d. about 1821. He was for a long period prior at Crato, Goyaz, Brazil, devoting himself to historical and geographical research, publishing in 1817, 'Corographia Brasilica, on relação historica-geographica do reino do Brazil,' a much valued work.

Cazalès, Jean Antoine Marie de, zhōn ān-twān mā-rē dē kā-zā-lās, French politician: b. Grenade, Haute-Garonne, France, 1 Feb. 1758; d. Engalin, Gers, France, 24 Nov. 1805. The son of a counselor of the Toulouse parliament, he served for some time in Jarnac's regiment of dragoons. Being chosen in 1789 a deputy of the noblesse to the States-General, he became one of the most able and eloquent opponents of the Revolution, but was treated with ingratitude by the royalists, although he had labored and suffered much in their cause, and barely escaped being put to death. Having traveled abroad during the reign of terror, he returned to France in 1801. Napoleon conferred on him, although he had refused to enter his service, the cross of the Legion of Honor. His 'Discours et opinions' and his 'Défense de Louis XVI.' were published in 1821.

Cazalla de la Sierra, kā-thāl'yā dā la sē-ēr'rā, Spain, a town in the province of Seville, and 36 miles northeast of the city of Seville, on a declivity of the Sierra Morena. Its streets are clean, paved, and well arranged; and it has two squares, in the principal of which are the ancient church and town-hall. The mountains in the vicinity are rich in metals. Pop. about 9,000.

Cazauran, kā'zō-rān, **Augustus R.**, Franco-American author and playwright: b. Bordeaux, France, 31 Oct. 1820; d. New York 27 Jan. 1889. He was educated at the University of Dublin. In 1848 he became implicated in an Irish rebellion, fled to the United States and obtained employment as a reporter. During the Crimean war he acted as war correspondent to a London daily. Afterward he was connected with the Cincinnati *Enquirer* and became chief editor of the Memphis *Argus*. When Lincoln was shot he was at the theatre as dramatic critic, and wrote the first account of the assassination. In 1869 he went to New York, did dramatic work, and gathered about him a remarkable company of artists. He adapted 'Miss Multon,' 'The Danicheffs,' 'Man of Success,' 'The Mother's Secret,' 'Lillian's Lost Love,' 'The Banker's Daughter,' 'The Celebrated Case,' 'Lost Children,' 'French Flats,' 'Mother and Son,' 'Feliccia,' 'The Creole,' 'Daniel Rochat,' 'A Parisian Romance,' and 'The Ranzar.'

Cazembe, kā-zēm'bē, or **Cazembe's Dominion**, Africa, a region formerly constituting a large and well-ordered negro state lying south and southwest of Lake Tanganyika, and taking its name from the title of the sovereign. The country forms a kind of basin, bounded on the east by a plateau which rises to the height of from 3,000 to 4,000 feet; on the west, also, it

is bounded by a series of heights. On the south it has the lofty watershed which separates its streams from those of the Zambesi River system. Its principal stream is the Chambezi, which flows westward into Lake Bangweolo, then northward, under the name of the Luapula, into Lake Moero. The ruler, or muata, used to be feared as a great magician; he had over 600 wives, and maintained a well-armed body of troops, numbering at one time, it is said, 20,000. His dominions were divided into districts, each of which had a governor of its own. These governors and other men of rank formed a body of privileged nobility; all the rest of the inhabitants, farmers, artisans, etc., were looked upon as slaves of the ruler. The population consisted of a ruling race, the Campololos, who had invaded and conquered the country, and the Messiras, the original inhabitants. It was only Campololos that received official posts, and the Campololo language was the one spoken at court. The people were industrious agriculturists, growing crops of mandioc, maize, sorghum, etc. They manufactured coarse cloths, cords, nets, lines, etc., from cotton and the fibres of certain plants; made weapons and implements of iron; also earthenware, wooden vessels, etc. Cazembe was visited by Lacerda in 1799, and by other Portuguese explorers in 1831. Dr. Livingstone, in 1867, stayed 40 days at the capital, which he found to consist of a number of huts dotted over a large area, and having probably not more than a thousand inhabitants. The Cazembe at this time was a usurper, whose cruelties had done much to depopulate the country, and it was doubtful if he could bring a thousand warriors into the field. The country, which had been ravaged by the slave trade, now belongs partly to the British sphere of influence, partly to the Congo State.

Cazin, Jean Charles, zhōn shārī kā-zān, French artist: b. Samer, Pasde-Calais, about 1840. He studied under Le Coqu de Boishaudran, obtained a first-class medal at the Salon in 1882 and was made an officer of the Legion of Honor 1889. He is best known as a landscape painter, although frequently introducing figures into his paintings. His coloring and sentiment are much admired.

Cazorla, kā-thōr'lā, Spain, a town in the province of Jaen and 41 miles east of the city of Jaen. It rises in the form of an amphitheatre on the slope of the Sierra de Cazorla, and is well built, though much less important and populous than in the time of the Moors, during whose wars it held an important position. The Sierra de Cazorla is a wooded ridge round which winds the upper course of the Guadalquivir. Pop. about 6,000.

Cazot, Théodore Joseph Jacques, tā-ō-dōr zhō-zēf zhāk kā-zō, French politician: b. Alais 11 Feb. 1821. In 1848 he was active as a Republican in his home department; in 1870 he was appointed general secretary in the ministry of the interior; in 1871 elected to the National Assembly; and in 1875 was made life senator. From 1879-82 he was minister of justice and was interested in bringing about a reform in the appointment of judges, but retired without passing the law he desired. In 1883 he was president of the court of cassation, resigning in 1884 on account of being implicated in fraudulent dealings.

CAZOTTE — CEBES

Cazotte, Jacques, zhäk kä zöt, French poet: b. Dijon 1720; d. 25 Sept. 1792. His masterpieces are: 'Oliver' (1762), a poem of chivalry after the manner of Ariosto; and 'The Devil in Love' (1772), a tale of wonder, still a popular favorite. He had extraordinary skill in versifying, as shown by his adding a seventh canto to Voltaire's 'Civil War of Geneva' with such perfect imitation of Voltaire's style and manner as to deceive all Paris.

Cazwini, kâz-wē'nē, Zacharia Ben Mohammed, Arabian naturalist: b. Cazwin, Persia, 1212; d. 7 Aug. 1283. He was descended from a family of lawyers, who derived their origin from Anas Ben Malek, a companion of Mohammed, and had settled in Cazwin, a city in Persia. From that place this author received the surname under which he has become celebrated. Of the circumstances of his life we know little more than that he was *cadi* of Wazith and Hillah, and died in the year of the Hegira 682 (1283 A.D.). His most important work is on natural history—'The Wonders of Nature and the Peculiarities of Creation'—of which Ideler, professor in the University of Berlin, published the chapter on the 'Constellations of the Arabians,' and of which there are fragments in Bochart's 'Hierozoikon,' in Ouseley's 'Oriental Collections,' and in Wahl's, Jahn's, and De Sacy's 'Arabic Chrestomathies.' It was the object of Cazwini, like Pliny, to describe the wonders of all nature. His work contains a comprehensive view of all that had been written before him, but in so grand and original a manner that it is of higher value than most of the original works which treat of the same subjects. There is an abridged translation of it in the Persian.

Cean-Bermudez, Juan Agustin, hoo-än' ä-goos'tin thā-än' bër-moo'dāth, Spanish archæologist: b. Gijen, Asturia, 17 Sept. 1749; d. Madrid 3 Dec. 1829. He devoted himself early to the study of the fine arts, into which he was initiated by Raphael Mengs. After holding a public office at Madrid, he retired to Seville, where he founded an academy of fine arts, and occupied himself with the study of their history. He was elected a member of the royal academies of history and fine arts at Madrid, and published several valuable works connected with his favorite pursuits. His most important book, entitled 'Sumarie de las antiguedades romanas que hayen España,' appeared posthumously in 1832.

Ceano'thus, a genus of shrubs and small trees of the natural order *Rhamnaceæ*. There are about 35 species, natives of the Pacific coast region of North America. They are characterized by serrate or entire simple leaves; small, perfect, white, purplish, or blue flowers in showy clusters, which are often paniced; and three-celled drupaceous fruits, which, on drying, separate into three stones. Many of the species and their hybrids are popular ornamental shrubs, especially in mild regions, their free-blooming habit rendering them specially useful as lawn specimens. Three species, *C. americanus*, *C. ovatus*, and *C. fendleri*, and some of their hybrids, are hardy in the north, but usually the hybrids must either be protected from frost or stored over winter in a plant-pit or frost-proof cellar. They succeed in almost any soil, but do best in light, well-drained loams,

especially when exposed to the sun. Propagation is easily effected by seeds, cuttings, or layers, *C. americanus*, known as New Jersey tea and red-root, is common from Canada to the Gulf States. Its leaves are said to be used as a substitute for tea, a use to which they are reported to have been put during the American Revolutionary war.

In medicine *ceanothus* has not been used to any great extent. Its roots contain from 6 to 10 per cent of tannin, and have been used in domestic medicine as astringents. Owing to the close resemblance of the roots, *ceanothus* has been used as an adulterant for rhatany.

Ceará, sã-ã-rã', Brazil, a state bounded on the north and east by the Atlantic Ocean and Rio Grande do Norte, on the south by Parahyba and Pernambuco, and on the west by Piahy. Its area is 40,250 square miles, and its population 881,686. The principal port and capital of the state is Fortaleza (q.v.), which is regarded as one of the most beautiful cities of Brazil. A railroad connects Fortaleza with Baturité. The principal exports of Ceará (statistics of 1899) are: rubber, cattle, cotton, hides, mules, preserved fruits, and hammocks. Coffee, sugar, wine of the cashew nut, oranges, and wax are also produced. The estimated value of all the exports is about \$5,000,000 annually, in which amount the United States shares to the extent of nearly one third. Ceará is divided into 27 comarcas, or counties. The most fertile and populous district is the upper Jaguaribe.

Ceará-mirim, a city in Brazil. Pop. 18,000.

Ceballos, José, hō-sã' thā-bäl'yōs, Mexican soldier: b. Durango 15 March 1830. In 1869 he had command of a regiment in the province of Yucatan; while here a portion of his soldiers revolted, but he suppressed the insurrection in three days; he also executed without authority several private citizens who were implicated in the revolt. In 1870 he was made brigadier-general and given command in the western states, where he had charge of the campaign against the bandit chief, Losada. When Lerdo de Tejada became president of Mexico, Ceballos was put in command of the force sent to depose Camerana, the governor of Jalisco. After a severe struggle between the state and government forces, Caballos was successful and became governor, a position which he held till 1876. At that time Tejada was deposed by Díaz; Ceballos joined with Iglesias, but was forced to leave Mexico for a time. He went first to California, then to Guatemala, where he was appointed director of a military school. Though at first plotting a revolution against Díaz he suddenly turned to his support, returned to Mexico, was restored to his rank, and made governor of the federal district. He has been a bitter enemy of the press, and in 1885-6 had a number of students and journalists arrested.

Ce'bes, of Thebes, Greek philosopher, a disciple and friend of Socrates, and the reputed author of the 'Pinax,' or "votive tablet," a philosophical dialogue representing allegorically the temptations of this life and teaching that true learning can alone make for happiness. In spite of its pure Attic, and its truly Socratic tendency, modern criticism now assigns the work to the 2d century A.D. It was extremely popular in

the Middle Ages, a sort of 'Pilgrim's Progress,' indeed; was translated into all the languages of Europe, as well as Arabic, which latter version, made possibly in the 9th century, is our sole record of the close of the dialogue. Modern editions are those of Drosihn (1871); Kraus, (1882); Parsons (1887).

Cebidæ, sĕb'ĭ-dĕ, a family of American monkeys, including the howler, saki, sapajou, spider-monkey (q.v.), etc. See also MONKEY.

Cebu, thā-boo' or sĕ-boo', Philippines, an island lying between Negros and Bohol, north of Mindanao. Its length northeast and southwest is 139 miles; width, 24 miles; area, 1,668 square miles. It has a mountain system consisting of a chain running the length of the island, nearer the east than the west coast. The mountains are not over 2,200 feet high, but their ascent is steep and it is difficult to cross them. There are six passes, the best being the southernmost, from Sibonga to Dumanjug, over which United States army officers constructed a temporary wagon road in the summer of 1900. The chief products are rice, chocolate, sugar, and coffee. There are manufactures of hemp and piña cloth, sugar-sacks, cocoanut wine, sugar, salt, and cheese. In 1827 coal was discovered in Cebu, the first found in the Philippines. It is of good grade, adapted to general use. The trade of the island is extensive. Besides the mountain passes there are two main highways, one on the east coast, and one on the west coast, while the port of Cebu has communication with Manila and the islands of the Visayan group. Cebu was first occupied by United States troops in February 1899. Operations against the insurgents resulted in driving them from their position, and capturing a large quantity of material of war. This island, with a few dependent islands, forms the province of Cebu, in which civil government was created under the provincial government act of 1901. At that time several of the cities had organized their municipal governments according to the code of the Philippine commission. Though the province was restored to military government for a time in 1901, civil government was permanently resumed in January 1902. Pop. (province) 518,000.

Cebu, Philippines, capital of Cebu province, situated on the east coast of the island of Cebu. The streets are wide and regularly laid out. There is a cathedral in one of the suburbs, and it has also several other churches and an Episcopal palace. Cebu is an important port with an extensive trade. It is the oldest Spanish settlement in the Philippines. In the "Rizal," a building in front of the Santo Nino Church, is the cross which it is said was planted near the town by Magellan when he took possession of the island. An old fort built by the Spaniards stands within the limits of the town. Pop. 35,243.

Cecchi, Giammaria, jām-mā-rĕ'ä chĕk'kĕ, Italian dramatist: b. Florence 14 April 1518; d. there 28 Oct. 1587. He was the rival of Bibbiena, Machiavelli, and Ariosto in portraiture of character and in liveliness of dialogue. Of his plays, 95 in number, but few have been printed. These are mainly imitations of Plautus and Terence; the best of them are: 'The Hammer'; 'The Slave'; and, the most famous

of all, 'The Owl.' He wrote also religious dramas; among them 'The Exaltation of the Holy Cross' (1580).

Cecco d'Ascoli, chĕk'kō dās'kō-lĕ, properly Francesco Stabili, Italian poet: b. Ascoli about 1257; d. Florence 16 Sept. 1327. He was a devoted student of astrology and of demonology. For the expression and defense of certain erroneous opinions he was burned at the stake. His heretical or impious doctrines are contained in a poem, unfinished but of encyclopædic compass, 'Bitternesses,' of which he lived to complete four books. The subject of the first book was astronomy with meteorology; of the second, stellar influence with physiognomy; of the third, minerals; of the fourth, sundry problems, moral and physical.

Cech, chĕk, **Sva'topluk**, Czech writer: b. Ostredk 21 Feb. 1846. He was editor in succession of several journals, and at the same time practised law. After winning some celebrity as a writer of stories and short poems, he made a bolder flight in 1872 with 'Dreams,' in which he shows great epic power. Besides this he has written several other poems, as 'The Adamites'; 'The Storm'; 'Songs of Morning.' He is the most popular of Czech poets. As a novelist he excels in lively wit and rich humor. Among his works of prose fiction may be named: 'Stories, Arabesques, and Humoresques'; and the amusing 'Candidate for Immortality.' He has written also 'Memories from the Orient' (1885), as well as later volumes.

Cecidomyia, sĕs-ĭ-dō-mī'ya, a genus of two-winged flies, of the family *Cecidomyiidae*, the gall-gnats (q.v.).

Cecil, sĕs'ĭl or sĭs'ĭl, **Evelyn**, English writer: b. 1865. He was educated at Eton and New College, Oxford, studied law and became a barrister of the Inner Temple. He was a private secretary to the Marquis of Salisbury, 1895-1902, and sat in the House of Commons as member for East Herts, 1898-1900. He was the last Englishman who conferred with Presidents Kruger and Stein prior to the beginning of the Transvaal war in 1899. He has published 'Primogeniture: a Short History of its Development in Various Countries and Its Practical Effects' (1895); 'On the Eve of the War' (1900).

Cecil, Robert, Earl of Salisbury, English statesman, second son of William Cecil, Lord Burleigh (q.v.): b. about 1563; d. Marlborough, Wiltshire, 24 May 1612. Having received the honor of knighthood he went to France as assistant to the English ambassador. On the death of Sir Francis Walsingham he succeeded him as principal secretary, and continued to be a confidential minister of Queen Elizabeth to the end of her reign. Having secretly supported the interests of James I. previous to his accession to the crown he was continued in office under the new sovereign and raised to the peerage. In 1603 he was created a baron, in 1604 Viscount Cranbourn, and in 1605 Earl of Salisbury. In 1608 he was made lord high treasurer, an office which he held till his death.

Cecil, William, LORD BURLEIGH. See BURLEIGH.

CECIL DREEME — CEDAR

Cecil Dreeme, a novel by Theodore Winthrop, published in 1862. By its brilliancy of style, crisp dialogue, sharp characterization, and ingenuity of structure, it won an immediate popularity.

Cecil'ia, Saint, Christian virgin and martyr; her day in the Roman calendar is 22 November. Her story as recounted in the 'Breviarium Romanum,' represents her as a Roman lady of noble birth, a Christian from childhood, and from her early years vowed to virginity. Yet her parents gave her in marriage to a young noble, Valerianus, whom Cecilia persuaded not only to respect her vow, but also to become a Christian; and he, converted, induced also his brother, Tiburtius, and their intimate friend, Maximus, to enter Christ's fold; shortly after these three suffered martyrdom together. Cecilia now, in anticipation of the same fate or the same crown, distributed her possessions among the poor, and this becoming known to the prefect of Rome he ordered her to be taken to his own mansion and there burned to death in the bath (*in balneo*). But the virgin, exposed to the flames for a day and a night, was found unhurt; and after the axe of the headsman had also failed to sever her head from her body, at last she won the double wreath of virginity and martyrdom; this was in the reign of Alexander Severus and in the pontificate of Urban I., about the year 230. Urban erected a church in her house which was called by her name. The Church of St. Cecilia is still one of the most notable churches of Rome, having been again and again repaired or reconstructed. In this account of Saint Cecilia nothing is said of the musical accomplishments of the virgin, but legend makes much of them; hence, Saint Cecilia is the patron saint of music and musicians, and musical societies are very commonly called by her name: Dryden's fine ode, 'Alexander's Feast: a Song for Saint Cecilia's Day,' is an imperishable monument of the Cecilian legend in English literature.

Cecilia, a novel by Frances Burney, published in 1782. It is a typical English novel of a century ago. The plot is simple, the story long drawn out, the style stilted, and the characters alone constitute the interest of the book, and justify Dr. Johnson's praise of Miss Burney as "a little character-monger."

Cecomorphæ, sē-kō-mōr'fē, one of Huxley's groups of schizognathous birds, now generally ranked as a sub-order or order, or split up in various ways among several orders. The palate has a narrow cleft on each side of the vomer, running the entire length between this bone and the palatines; the nostrils are usually narrow slits, but are sometimes tubular; the feet are always webbed, with three toes directed forward and the hallux small or wanting, and never connected to the other toes by a web. The *Cecomorphæ* are all aquatic birds, and may be subdivided into the *Pygopodes* or divers, and the *Longipennes* or long-winged swimmers. The former includes the following important families: *Alcidæ*, the auks, puffins, and guillemots (qq.v.); *Podicipedidæ*, the grebes (q.v.); *Heliornithidæ*, the sun-birds (q.v.); and *Colymbidæ*, the divers (q.v.). The *Longipennes* group includes two families, the *Procellariidæ* or petrels, albatrosses, and shearwaters (qq.v.); and the *Laridæ*, or gulls, terns, and skimmers (qq.v.).

Cecro'pia, a genus of plants of the order *Artocarpaceæ*, of which the best known species is the trumpet-tree (*C. peltata*) of the West Indies and tropical South America. It attains a height of about 50 feet, and has a hollow stem and branches, from which musical instruments are made. Its leaves are very large, circular, and peltate, and serve as food for sloths; and its flowers are small and grouped in short spikes, several of which are enclosed at first in a large bract. The wood is light and soft, and is employed by the natives in various ways, particularly for the purpose of obtaining fire by friction. Ropes are made from the inner bark, and the outer bark has astringent properties. Caoutchouc is obtained from the juice, and the buds are employed as a pot-herb. Ants utilize the hollow stems as dwellings.

Cecropia Moth, a colossal species (*Samia cecropia*) of the family *Saturniidæ*. The moth expands five or six inches and is brick-red in color, the wings tinged with grizzly, each wing with a large crescent-shaped spot near the centre, which is red and white, or white-edged with red and black; on the apex of each fore wing is a large, black, eye-like spot. The caterpillar is a large green worm three to four inches in length, protected by large tubercles colored green, blue, yellow, or red. It is not uncommon on the elder, willow, apple, currant, pear, thorn, poplar, etc. At the end of summer it spins a large cocoon, open at one end,—not oval, as in those of *Telea polyphemus* and the luna moth,—and attaches it to a branch of a tree. An allied species in northern Maine and Canada is *S. columbia*, while in the Rocky Mountain region, Colorado and Wyoming it is represented by *S. gloveri*, and on the Pacific coast by *S. californica*. The silk of this species cannot be used because its fibres are not continuous.

Cecrops, sē'krōps, according to Greek tradition, the founder of Athens, and the first king of Attica. He was said to have been an autochthon (sprung from the soil), and was sometimes represented as half man, half dragon. He taught the savage inhabitants religion and morals, made them acquainted with the advantages of social life, and laid the foundation of the future city of Athens, which after him was originally called Cecropia. He is also said to have introduced the art of ship-building. He died after a reign of 50 years. By the later Greeks he was represented as having led a colony to Attica from Sais in Egypt about 1400 or 1500 B.C., but the best modern critics do not look upon this event, nor on the life of Cecrops at all as historical. There is no doubt that Egypt did have a certain influence on the development of civilization in Greece, but how great this influence was, or in what manner exercised, history does not furnish sufficient data to enable us to decide. It is probable that the true Cecrops was a hero of the Pelasgian race.

Cedar, various cone-bearing evergreen trees and their wood; also several non-coniferous trees. The most widely known are probably the cedar of Lebanon (*Cedrus libani*), the deodar, or goa-tree, of India (*C. deodara*), and the African or Mount Atlas cedar (*C. atlantica*). These three species are regarded by some botanists as mere varieties of the first-named species. They are large ornamental evergreen trees with wide spreading branches which give

CEDAR — CEDAR CREEK

them a form distinct from most other cone-bearing trees. They are sometimes planted in southern California and the Gulf States, and the last-mentioned species even as far north as Philadelphia, where it can stand the winter in sheltered situations. They are readily propagated by seeds, and thrive well in well-drained loamy soil. From ancient times their odorous, light-red wood has been used for fine furniture and interior house-finish. The white gum of the cedar of Lebanon, which oozes from the trunk and branches, was formerly employed in embalming, but the forests of this tree have become so much reduced that neither the resin nor the oil made from it are in commerce. The other species are most abundant, the deodar in India and the Atlas cedar in northern Africa. Their timber is widely used for fine cabinet work.

The red cedar (*Juniperus virginiana*) is a well-known very variable tree found from Canada to Florida, and westward to the eastern slope of the Rocky Mountains. It attains a height of about 100 feet; has a conical more or less spreading head with upright limbs; ever-green, spiny, pointed leaves, and brownish or bluish globular fruits covered with bloom. The wood is largely used for fence-posts. The white cedar (*Thuja occidentalis*) is also a well-known American tree found in wet ground from Maine to Florida, and westward to the Mississippi River. It attains a height of 70 to 80 feet; has erect spreading branches; thin and slender pendulous twigs; fragrant, glaucous, green leaves; and tiny bluish-purple cones covered with bloom. The trees are highly ornamental, and, being hardy, are general favorites in the north. The wood is especially useful in moist places. The name white cedar is often applied to the *Arbor vitæ*. The yellow cedar (*Cupressus nootkatensis*), a common tree on the Pacific coast from California to Alaska, is valued, in cabinet work and interior house-finishing, for its light-yellow wood, which takes a high polish. Like its relative mentioned above, it is often planted for ornament. In its home it often exceeds 100 feet in height. The best known non-coniferous trees that are sometimes called cedar are probably *Cedrela odorata* (see CEDAR, BARBADOES) and *Cedrela toona*, the Australian cedar. See TOONA; JUNIPER.

Cedar, Barbadoes, a tall tree (*Cedrela odorata*) of the natural order *Meliaceæ*. It is a native of the West Indies, where its wood is highly valued for making certain kinds of furniture, cigar-boxes, canoes, and shingles. It is also exported for the manufacture of lead pencils. It often attains a height exceeding 75 feet and a great girth. It bears pinnate leaves 10 to 20 inches long; pendulous terminal panicles of inconspicuous whitish flowers, followed by dehiscent fruits about half an inch in diameter, containing numerous flat-winged seeds. The bark, leaves, and fruits smell like assafœtida, but the wood is pleasantly fragrant. The tree is often planted for its ornamental qualities, especially along avenues. It thrives in southern California and in the Gulf States. Several of its relatives, especially *C. sinensis*, which is hardy as far north as Philadelphia, are also similarly used. See TOONA.

Cedar-apples, fungous outgrowths upon juniper and red cedar trees. They are caused by

the parasitic fungus *Gymnosporangium macrospus*. At first they appear like warts upon the smaller branches and twigs, becoming chocolate color or brown as autumn advances, and remaining attached and unchanged until spring, when they enlarge into horn-shaped, jelly-like masses that resemble sponge. At this time they produce their abundant spores which, as the masses become dry, are blown away by the wind and, alighting on apple-trees, produce rust on the foliage and other green parts. They will not germinate upon cedar or juniper, but require an alternate host, the apple, to complete their life cycle. For methods of control see APPLE (*Diseases*); FUNGICIDE.

Cedar-bird, the common American wax-wing (*Ampelis cedrorum*), a bird found throughout North America, breeding from the latitude of Kentucky northward. In most localities it is only partially migratory. It is a beautiful bird of delicate unobtrusive colors, generally ashy-brown with a purple tint on the head, the front of which, like the throat, is black. The tail-feathers are tipped with yellow, and the wings are crossed by a white bar, below which are the peculiar red sealing-wax-like appendages. The head is gracefully crested. The cedar-birds spend most of the time in flocks, which wander according to the supply of food and are noteworthy for the uniformity with which all members alight or rise together. The food consists chiefly of berries when these are to be had, on which account they have received the name of cherry-birds in some sections. Nesting takes place late, when the summer is well advanced, and the rather bulky structure is usually placed in an apple or other orchard tree. The eggs are four to six in number, pale blue, and thickly speckled.

Cedar Creek, a stream in Shenandoah County, Virginia, flowing into the North Fork of the Shenandoah River.

Cedar Creek, Battle of. After the battle of Fisher's Hill, 22 Sept. 1864, Gen. Sheridan followed Early as far as Harrisonburg, his cavalry going as far as Port Republic, Staunton, and Waynesboro. In view of the difficulty of supplying his army so far from its base, and of other operations by which two corps of infantry and a cavalry division of his army were to be sent to the Army of the Potomac, he holding only the lower valley of the Shenandoah, Sheridan, after ordering the destruction of all mills, barns, grain, forage, and provisions of all kinds, began to withdraw down the valley on 5 October, and on the 8th recrossed Tom's Brook. His rear had been so persistently followed and harassed by the Confederate cavalry divisions of Rosser and Lomax that he ordered Torbert, his cavalry commander, to whip the Confederate cavalry or get whipped. On the morning of the 9th Torbert fell upon Rosser and Lomax, and in a two-hours' contest routed them, pursuing many miles and capturing over 300 prisoners, 11 guns, and 40 wagons. Sheridan then resumed his march, and on the 10th halted on the north bank of Cedar Creek. Wright's Sixth Corps continued its march to Front Royal, on the way to Washington, where it remained two days, and then marched toward Ashby's Gap, but was recalled to Cedar Creek, where it arrived on the 14th. Early had been reinforced by Kershaw's division and about 600 cavalry,

CEDAR CREEK

increasing his force to about 18,000 men, and under Lee's order to detain the Union troops in the valley he had followed Sheridan, arriving at Fisher's Hill, six miles from Cedar Creek, on the 13th. On the night of the 15th Sheridan left for Washington to consult with Stanton and Halleck, leaving Gen. H. G. Wright in command of the army. Sheridan's cavalry accompanied him to Front Royal, from which point he intended to push it through Chester Gap to the Virginia Central R.R. at Charlottesville and raid the country east of the Blue Ridge, but upon erroneous information that Longstreet was moving to join Early, the raid was abandoned and Torbert moved the cavalry back to Cedar Creek. On the night of the 18th Emory's Nineteenth corps was on the west side of the valley turnpike, on elevated ground overlooking Cedar Creek. Wright's Sixth corps in reserve to the right and rear of the Nineteenth, separated from it by Meadow Brook. Merritt's cavalry division was on the right of the infantry, and Custer's division $1\frac{1}{2}$ miles beyond Merritt's, watching the crossings of Cedar Creek and the roads on the right. Crooks' Eighth corps was on the east side of the pike, one of its two divisions (Thoburn's) on a rounded, entrenched hill, one fourth of a mile in advance of the other, near the junction of the creek and river, and both somewhat in advance of the Nineteenth corps on the right. Two cavalry brigades of Powell's division were far to the left, near Front Royal, and one at Buckton Station, two miles beyond Crooks' left. The Union army numbered about 31,000 men. Reconnoissances were sent out daily from the flanks to see what Early was doing, and that of the Eighteenth reported that the indications were that he had retreated from Fisher's Hill. He had not retreated, but had matured a plan of attack. A reconnoissance by Gen. Gordon had disclosed the fact that the left of the Union line was lightly picketed, with but a small cavalry force on the North Fork of the Shenandoah, and that it was practicable to move infantry secretly by night across the creek, which was easily fordable, and through the woods to within less than half a mile of Crooks' left and rear. This plan Early adopted, assigning for the movement the divisions of Gordon, Ramseur, and Pegram, and Payne's cavalry brigade, all under command of Gordon. Early, with the divisions of Kershaw and Wharton and all his artillery, was to co-operate in the effort to crush the Union left and centre. Two brigades of cavalry were to demonstrate on the Union right, and Lomax's cavalry, moving by Front Royal, was to strike the valley pike in the Union rear. The movement began after dark of the 18th. Gordon led his column across the North Fork of the Shenandoah, down its right bank, and again crossing below the mouth of Cedar Creek, reached his assigned position before daylight. Early led Kershaw across Cedar Creek, midway between its mouth and the pike, and at the first flush of dawn, covered by darkness and fog, captured or drove in the picket line and rushed over the intrenchments held by Thoburn's division, at a point where they were not manned, surprised the camp, soon swept everything out of it, and captured seven guns, which were turned upon the fugitives. Kershaw then advanced on R. B. Hayes' division and Kitching's brigade, and at the same time Gordon

charged out of the woods directly upon Hayes' left and rear, the combined attacks breaking his division and Kitching's brigade, and uncovering the left of the Nineteenth corps, which was now assailed by Kershaw and Gordon, while at the same time Wharton's division, moving swiftly down the pike, followed by 40 pieces of artillery, attacked in front, and the greater part of the Nineteenth corps, abandoning 11 guns, was swept from the field. Wright, who had foreseen at the beginning of the attack that his position was untenable, and a change of front necessary, now ordered the Sixth corps, under Gen. Ricketts, who was moving with two divisions to support the left, to fall back to some tenable position, and the Nineteenth corps was ordered to rally on the right of the Sixth. The Confederates followed up their advantage, taking many prisoners, but were checked by the Sixth corps, Wharton being badly repulsed. Early still pressed matters; it was now 9 o'clock, and Wright, losing six guns of his own corps, withdrew to a more favorable position one and a half miles north and west of Middletown, where he was joined by the cavalry brigade from Buckton and by Torbert, with the two cavalry divisions that had been ordered from the right to left of the infantry line; while the division commanders of the Sixth and Nineteenth corps were told the enemy would be attacked about 12, noon, as soon as an ample resupply of ammunition could be issued. Meanwhile Sheridan, who had arrived at Winchester on the afternoon of the 18th, was hastening to the front, meeting on the way a stream of fugitives, whom he ordered to turn back, as he intended to reoccupy the old camp that night. He arrived on the field a little after eleven o'clock, during a lull in the fight, after Wright had reunited the divisions of the Sixth corps, which had been fighting by themselves during the morning, and after the Nineteenth corps had been rallied and placed in line, also parts of the Eighth corps, the only part of the army seriously engaged being a division of the Sixth corps and the cavalry, tenaciously holding the valley pike, the key-point of the battle. Wright's disposition of the infantry was approved, and the only change made in the line was to send Custer's cavalry back to the right of the infantry. About one o'clock Early pushed forward his entire line, but was quickly repulsed, and then busied himself in collecting his stragglers, who were plundering the captured camps, getting his prisoners and captured guns and wagons back to Fisher's Hill, and throwing up a defensive line beyond the reach of the Union artillery. At four o'clock Sheridan saw a movement of Early's, which he thought indicated an attack, and ordered a general advance, the Nineteenth corps on the right, the Sixth on the left, with the Eighth following in reserve, Custer's cavalry on the right, and Merritt's on the left of the infantry. The movement developed into a left half-wheel, and after a very severe and obstinate fight, during which parts of the Union line were repulsed, again to go forward, was successful; the Confederate line was broken near its left, other parts of the line gave way, and soon the entire army fled in panic and disorder from the field and across Cedar Creek, Sheridan's infantry following as far as the creek, the cavalry continuing the pursuit three miles beyond and until after dark, capturing guns, wagons, ambulances,

CEDAR FALLS — CEDAR MOUNTAIN

and prisoners. Early, with but few of his men, rested at night in his intrenchments at Fisher's Hill, and at 3 o'clock next morning retreated to New Market, followed by Sheridan's cavalry as far as Woodstock. The 24 guns captured by Early were retaken, and he left in Sheridan's hands 23 of his own. The Union loss was 644 killed, 3,430 wounded, and 1,591 missing; of the latter 1,429 were sent as prisoners to Richmond. The Confederate loss was 320 killed, 1,540 wounded, and 1,050 missing. Early's offensive movement suspended for a time the transfer of any part of Sheridan's army to the Army of the Potomac; his defeat ended efforts on the part of the Confederates to invade the North by way of the Shenandoah valley. Consult: 'Official Records,' Vol. XLIII.; Pond, 'Shenandoah Valley in 1864'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.; Sheridan, 'Personal Memoirs'; Keifer, 'Slavery and Four Years of War,' Vol. II.

E. A. CARMAN.

Cedar Falls, Iowa, a city in Black Hawk County, situated on Cedar River and on the Burlington, C. R. & N., the Illinois Central, and the Chicago & G. W. R.R.'s, 85 miles northeast of Des Moines. It is actively engaged in manufacturing, having a foundry, a pump factory, and mills turning out flour, oatmeal, paper, etc. A State normal school is located here. Pop. (1900) 5,319.

Cedar Keys, Fla., a seaport in Levy County, on the Gulf of Mexico, 118 miles southeast of Tallahassee. It takes its name from the keys surrounding the harbor. There is a lighthouse on one of the keys. The town has a large trade in pine, cedar (largely used for pencils), sponges, and fish. Pop. (1900) 739.

Cedar Lake, a lake of Canada, in the Saskatchewan district, a sort of expansion of the river Saskatchewan, receiving the waters of this large stream to pour them over the Grand Rapids into Lake Winnipeg. Between Grand Rapids and Cedar Lake is another expansion, known as Cross Lake. Cedar Lake is nearly 30 miles long, and where widest 25 broad; area about 312 square miles. Its depth of water is sufficient for the largest craft, except on the northwest, where the quantity of alluvium brought down by the Saskatchewan is rapidly filling it up. Both the mainland and the islands are well wooded with balsam spruce, birch, poplar, tamarack, Banksian pine, and cedar, the last growing on the shores of the lake, particularly the northwest, and giving it its name.

Cedar Mountain, Cedar Run, or Slaughter's Mountain, Battle of. On 8 Aug. 1862, Crawford's brigade of Bank's corps marched from Culpeper Court-house, eight miles to Cedar Run, to support Bayard's cavalry brigade, which was being driven back by Stonewall Jackson, who, with the three divisions of C. S. Winder, Ewell, and A. P. Hill, in all nearly 24,000 men, was advancing from Gordonsville to seize Culpeper. On the 9th Bank's entire corps, at Little Washington, was ordered to follow Crawford, and Sigel was ordered to march his corps from Sperryville to the same point. Banks joined Crawford at Cedar Run about noon and took position on elevated ground just beyond it, covering the road to Culpeper, Crawford's brigade and six companies of the 3d Wisconsin,

of Gordon's, on the right of the road, partially concealed in woods. Gordon's brigade was held in reserve on the hither side of the stream. Across the road on Crawford's left was Geary's brigade; Prince's brigade was on Geary's left, and Greene's small brigade to the left of Prince and somewhat refused. Seven batteries of artillery were distributed on the plateau slightly in advance of the infantry. Banks had about 8,000 men. Jackson crossed the Rapidan on the 8th, and about noon of the 9th drove back Bayard's cavalry, and following, came under fire of the Union artillery and prepared for battle. Early's brigade was ordered to advance, keeping to the right and close to the Culpeper road, while Ewell led his two other brigades farther to the right along the slope of Cedar Mountain. Early advanced until he came under severe artillery fire, when he halted under cover of a small hill, and C. S. Winder's division and three batteries came up on his left, Campbell's brigade on the extreme left, then Taliaferro's, with Winder's brigade in reserve. While placing his batteries on and near the road Winder was mortally wounded by a piece of shell. It was now five o'clock, and Banks gave the order to advance and attack. The three brigades of Crawford, Geary, and Prince threw out skirmishers, drove in those of the Confederates, and the main line advancing became severely engaged. Early's right held its own against Prince, but on the Union right Crawford, advancing with great impetuosity, attacked and routed Campbell's brigade; then swung to the left, fell upon and (with the assistance of Geary) routed Taliaferro and shook Early's left. It was going hard with Early when Hill's division came up and, forming on his right and left, restored the fight, checked Crawford's further success, drove him and Geary back, and held Prince in check. Then the 10th Maine, of Crawford's brigade, which had been held in reserve, went forward on the extreme right, and in less than 10 minutes was compelled to retreat with a loss of nearly one half its men. At the same time a battalion of Pennsylvania cavalry charged down the road and was instantly driven back in disorder. Gordon's brigade came on the field as the 10th Maine was going out. In its advance it moved a little to the right of where the 10th Maine had been, and was met by the brigades of Branch, Archer, and Winder, with such a withering front and flank fire that it was badly cut up and parts of it driven, again to rally and go forward, but, under cover of the woods, Pender's brigade gained its right and rear, poured in a volley and drove it from the field. The artillery had now been withdrawn and the Confederates advanced. Prince's brigade fell back, leaving Prince and many of the men prisoners, and Greene, on the extreme left, who had not been seriously engaged, but had held Ewell's two brigades in check, was withdrawn. Night had now fallen, but Jackson, desiring to enter Culpeper before morning, gave immediate pursuit, and when 1½ miles from the field was checked by Banks' rallied troops and Rickett's division, which had come up from near Culpeper, followed later by Sigel. Gen. Pope also had arrived and assumed command. The Union loss was 1,759 killed and wounded and 594 missing. The Confederate loss was 1,338 killed and wounded and 31 missing. Pope and Jackson confronted each other on the 10th

CEDAR MOUNTAINS — CEHEGIN

and 11th, but on the night of the 11th Jackson retreated, abandoning many of his wounded, recrossed the Rapidan, and marched to the vicinity of Gordonsville. Consult: 'Official Records,' Vol. XII.; Ropes, 'The Army Under Pope'; Gordon, 'Army of Virginia'; Allan, 'Army of Northern Virginia in 1862'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II.

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Cedar Mountains, a mountain range in Cape Colony, extending nearly along the meridian of 19° E., for about 25 miles southward, beginning with lat. 32° S., and rising at some places to a height of 5,000 feet. Cedar trees of gigantic size formerly covered these mountains, and still do so to a considerable extent. The mountains contain many Bosjesman caves.

Cedar Rapids, Iowa, city in Linn County, on the Cedar River, and the Chicago & N. W., Chicago, R. I. & P., Chicago, M. & St. P., and Illinois C. R.R.'s; 219 miles west of Chicago and 310 miles north of Saint Louis. It is an important railway and manufacturing centre, and has valuable water-power. The city is built on terraced hills on both sides of the river, which is here crossed by several bridges. The streets are paved with brick and asphalt, and it has large and well-planned parks and excellent sewer, water, trolley, and gas and electric lighting systems.

Industries, etc.—Cedar Rapids is the centre for a rich agricultural region and has an extensive wholesale trade. The census of 1900 returned 241 manufacturing establishments; capital, \$6,256,801; persons employed, 3,441; wages, \$1,600,269; value of products, \$12,715,897. These figures did not include the American Cereal Co., whose mills employ 800 persons and have a daily capacity of 5,000 barrels. The Chicago, Rock Island & Pacific railway shops employ nearly 1,000 men. Other industries are pork-packing, and the manufacture of flour, cereals, pumps, windmills, starch, furniture, agricultural implements, dairy, creamery, and egg supplies, wagons and carriages, planing-mill products, and confectionery. There are 3 national and 5 other banks; and daily, weekly, and monthly newspapers.

Institutions, Buildings, etc.—Cedar Rapids is the seat of Coe College (Presbyterian), has excellent public and private schools, a business college, and public and Masonic libraries. It has many handsome private residences and churches, hospitals, a post-office and Federal Court building, Masonic Temple, auditorium, and fine business and railway buildings.

History, etc.—The first settlement at the rapids of the river was in 1845. The city was incorporated in 1856, and the charter revised in 1898. The mayor and city council are elected for two years. Pop. (1890) 18,020; (1900) 25,656.

Cedar, or Red Cedar, River, a river rising in the southern part of Minnesota and flowing southeast through the eastern part of Iowa to Muscatine County, where it turns southwest and empties into the Iowa River, after a course of about 350 miles.

Cedilla, *çè-dil'la*, a mark used under the letter c in French and Portuguese when the c stands before a, o, or u, to indicate that it is

to be pronounced like the English s, not like k, as is usual before these letters. A c with the cedilla under it is written c.

Cedrela, *sèd'rè-la*, a genus of large timber trees, natives of the tropics of both hemispheres, giving name to the order *Cedrelaceæ*, which is now usually included in *Meliaceæ*. The species have evergreen, equally pinnate leaves, and small bell-shaped white flowers. *C. odorata* of Honduras and the West Indies yields bastard cedar. *C. australis* is a valuable Australian timber tree. *C. toona*, a native of Bengal, furnishes timber much like mahogany. The bark is very astringent, and has been found valuable in fevers, dysentery, etc. The flowers are used for producing a red dye. The bark of *C. febrifuga* is used against the intermittent fevers of Java.

Cedrelaceæ, *sèd-rè-lâ'sè-è*, the mahogany family, a natural order of dicotyledonous plants, nearly allied to, if really separate from, the *Meliaceæ*. They are trees with alternate pinnate leaves and a woody capsular fruit. Different species yield mahogany, satin-wood, etc. The typical genus is *Cedrela* (q.v.).

Cedric, a steamship of the White Star Line, a type of modern steamship construction. She was built by Messrs. Harland & Wolff, at Belfast, Ireland, and is constructed of steel. Her length is 700 feet; greatest breadth, 75 feet; and depth, 49 feet 4 inches. Her gross tonnage is 21,000, and her displacement tonnage 38,200. Her launching weight was 14,257 tons, and her dead-weight carrying-capacity 18,400 tons. She has nine decks and is built on the cellular double-bottom principle, with many water-tight compartments designed to render her practically unsinkable.

The Cedric is propelled by twin screws, driven by two sets of quadruple engines, to operate which eight double-end boilers are employed, each capable of working up to a pressure of 210 pounds to the square inch. The oval funnels which carry off the smoke and waste gases from her furnaces are 14 feet 3 inches by 11 feet in diameter, and the height from their top to the keel is 131 feet. While the vessel is not built for speed, she is yet capable of developing 17 knots an hour, a rate which enables her to cover the passage between New York and Liverpool in from seven to eight days.

Passenger accommodations are provided for 350 in the first saloon, 250 in the second saloon, and 2,000 in the steerage. With 335 in the crew, her total population, with all berths filled, will amount to 2,935. The saloon dining-room is situated on the upper deck and covers the extreme width of the vessel. Some idea of the ship's massive construction may be gained from the fact that some of her plates weigh as much as three tons, while her great stern frame contains over 50 tons of metal.

Cehegin, *thā-ā-hèn'*, Spain, a town in the province of Murcia and 39 miles west-northwest of the city of Murcia, four miles east of Caravaca, on a declivity facing the south. It has numerous spacious streets, and two squares, lined with substantial houses and neat public buildings, comprising a parish church, three chapels, town- and court-houses, a prison, hospital, theatre, cemetery, and several schools. The manufactures include paper, cloth, soap, pottery, brandy, wine, and oil. There is also trade in grain, wool, hemp, silk, wax, cotton,

CEILING — CELEBES

etc. In the neighborhood various quarries of jasper and variegated marble are wrought. Pop. 12,000.

Ceiling, the upper surface of a room. The word seems to have been suggested by the use of arched coverings for churches, and even for rooms, which prevailed in the Middle Ages, and was not unknown to the Romans. Arched ceilings among the Romans were known by the name *cameræ* or *camera*, the Greek origin of which seems to furnish an argument in favor of the view that the arch was known to the latter people. The camera was formed by semi-circular beams of wood, at small distances from each other, over which was placed a coating of lath and plaster. In later times the *cameræ* were frequently lined with plates of glass, when they were termed *vitreæ*. But the ceilings most common among the Romans were flat, the beams, as in modern times, having been at first visible, and afterward covered with planks and plaster. Sometimes hollow spaces or panels were left between the planks, which were frequently covered with gold and ivory, or paintings. The arched ceilings of the Romans were commonly of brick or concrete covered with stucco, and were of three kinds: barrel vaults, groined vaults, and domes. The favorite ceiling in the East was the dome, that in the West during the Middle Ages, was the groined and ribbed vault. Modern ceilings are generally flat and are of plaster or wood. When the ceiling is divided into deep panels it is said to be coffered. See VAULTING.

Celakowsky, *chā-lä-köv'skē*, **Fran'tisek Lad'islaw**, Bohemian poet and philologist: b. Strakonitz 7 March 1799; d. Prague 5 Aug. 1852. He was destined for the pulpit, but from patriotic impulses declined to adopt that profession, and engaged in 1821 as instructor in a nobleman's family. In 1828 he became associate editor of the 'Quarterly Review for the Catholic Clergy,' published by the consistorium at Prague, and in 1834 editor of the 'Bohemian Gazette,' and of the 'Bee,' a literary journal. He also commenced a series of lectures on the Cechic language and literature, at the university of Prague. He lost both his situation as editor and that at the university, in consequence of a remark against the Emperor Nicholas. The Bohemian society for the propagation of science elected him a member in 1840. In 1842 he accepted a professorship of the Slavic language and literature, recently established by the king of Prussia for the benefit of his Polish subjects, at the university of Breslau. After the events of 1848, the Austrian government, which now sought for support from the Cechic nationality, offered him a professorship at the university of Prague. Of his numerous works, the following are most remarkable: 'Poems' (1822); 'Slavic National Songs' (1822-7); 'Lithuanian National Songs' (1827); a metrical translation of Walter Scott's 'Lady of the Lake' (1828); a translation of Augustine's 'De Civitate Dei' (1829-32); 'Echo of Russian National Songs' (1829); 'Echo of Cechic National Songs' (1840). One of his latest works was the 'Popular Philosophy of the Slavic Nations in their Proverbs' (Prague 1851). After 1835 Celakowsky was engaged in a comparative study of all the Slavic dialects, the fruit of which is given in part in his additions to Jungmann's

Cechic dictionary. As a poet he is distinguished by the grace and *naïveté* of his popular songs.

Celandine, *sěl'an-din* (*Chelidonium*), a genus of herbs of the natural order *Papaveraceæ*. The few species are natives of Europe, where they are widely distributed, and whence they have spread to other parts of the world. It is common in some of the older parts of the United States, having escaped from gardens. Common celandine (*C. majus*), which is most frequently seen, is an ill-smelling biennial or perennial plant with brittle hairy stems, pinnate leaves, small yellow flowers in small umbels, and slender two-valved pods. The plant has long been popular in old-fashioned gardens. It is easily grown from seed and produces abundant flowers all through summer. All parts contain an acrid yellow juice, for which the plant has been sometimes used in medicine, though it is now used practically only by the Eclectics. It is a drastic purgative, but its action is very irregular and difficult to control, and hence it has not been introduced into regular medicine because of its many inequalities.

Celano, **Tommaso da**, *tōm-mä'sō dā chā-lä'nō*, one of the reputed authors of the Latin hymn 'Dies Iræ': b. Celano, in the Abruzzi, toward the end of the 12th or about the beginning of the 13th century; d. Italy after 1250. He was one of the most devoted adherents of St. Francis of Assisi, and after the establishment of an order of Minorite friars on the Rhine was appointed keeper (*custos*) of the Rhine districts. In 1230 he returned to Italy. He wrote a life of St. Francis, and several hymns. His claim to the authorship of the 'Dies Iræ' seems now fairly well established, but is still disputed in favor of Matthäus Aquasparta (d. 1303), Cardinal Frangipani (d. 1294), and even St. Bernard, Gregory the Great, and others. His name is first mentioned in connection with the poem toward the close of the 14th century.

Celastraceæ, *sěl-äs-trä'sē-ē*, an order of polypetalous dicotyledons, consisting of shrubs and small trees, natives of southern Europe, Asia, America, Australia, etc., most of them of no great importance. They have generally acrid properties. The chief genera are *Celastrus*, *Euonymus*, and *Elæodendron*.

Celaya, *sā lä'ya*, Mexico, a town in the state of Guanajuato, on the Rio Laja, about 150 miles northwest of the city of Mexico. It has several fine plazas, handsome churches, among which is that of Our Lady of Carmen, a magnificent structure, and manufactures of cotton and woolen cloths, saddlery, and other articles. The burning of its bull-ring, on Easter Sunday, 1888, caused considerable loss of life. Pop. 22,000.

Celebes, *sěl'ě-bēs* or *sěl'ě-bēz*, Dutch East Indies, one of the larger islands of the Indian Archipelago, between Borneo on the west and the Moluccas on the east, extending from lat. 1° 45' N., to 5° 52' S., and from lon. 118° 45' to 125° 17' E., remarkable for the singularity of its shape. It consists mainly of four large peninsulas stretching to the east and south, and separated by three deep gulfs. The total area of the island is a little over 71,000 square miles.

Celebes is high and mountainous chiefly in the centre and the north, where there are several

CELERES — CELERY

active volcanoes. The absence of extensive deltas, and the intervention of broad grassy plains between the forests, distinguish it from the other larger islands of the Indian Archipelago. All that is most majestic and lovely in these is thought to be concentrated in this island. It abounds in the most picturesque and varied scenery, and the most beautiful and magnificent tropical vegetation. Though cut by the equator, and wholly within the torrid zone, Celebes is considered remarkably healthful, the natives often enjoying a vigorous old age, and Europeans living longer than anywhere else in the East. Its extreme heats are tempered by the sea-breezes, by monthly rains, and by the north winds that prevail for part of the year. The east monsoon lasts from May to November, and the west during the remaining months. The soil generally consists of a bed of vegetable mold from 10 to 20 feet thick, on decomposing basalt. Gold is found in all the valleys of the north peninsula, which is often convulsed by earthquakes, and abounds in sulphur. Copper of good quality occurs at various points, and in Macassar tin also, as pure as that of Banka. Diamonds are sometimes found almost at the surface of the ground, and precious stones are carried down in the sand of the torrents. The island is entirely destitute of the large carnivorous animals and pachyderms. None of the cat kind are seen in its forests; nor has it the elephant, the rhinoceros, or the tapir. Deer and wild hogs abound, together with the babirusa and herds of antelopes. Pouched animals, unknown in the Sunda Islands, here first occur, and there is a black tailless baboon or ape. Among domesticated animals are found small but vigorous horses, buffaloes, goats, sheep, and pigs. Trepang and turtle are caught in abundance. Among the trees are the oak, teak, cedar, upas, bamboo, etc.; among plants requiring more careful cultivation, the coffee-tree, indigo, cacao, sugarcane, manioc root, and tobacco.

The maritime districts of Celebes are inhabited by Malays; the Peninsula of Macassar by Bugis and Macassars. Mandhars dwell in the west of the island, and the mountainous regions in the interior are inhabited by Alfures. In the harbors also there are many Chinese and Oorang Badjus or Oorang Laut, a mixed race partly of Malay and partly of Battak origin, who live in their boats, and roam over the whole archipelago, gaining their livelihood by fishing. The natives are subject to several petty rulers, more or less dependent on the Dutch. The capital is the town of Macassar, in the southwest of the island, in the bazaar of which are sold all the products of the neighboring islands as well as of Celebes itself, among which are bamboo canes, sandal-wood, cajeput oil, nutmegs, rice, coffee, pearls, birds'-nests, trepang, birds of paradise, etc. The trade in trepang is very important, Macassar being the chief staple place for this article of commerce. The chief harbor of the north is that of Kema, on the east coast of Minahassa. The coffee of Menado is excellent, and is even preferred to the best Javanese coffee. A recent return states the number of coffee-trees in Minahassa at nearly 6,000,000 and the export of coffee at about 5,000,000 pounds. The harvest of cocoanuts is also considerable. A European controller superintends the cultivation of the coffee-tree in his own district, advises the village chieftains,

acts as the protector of the natives, and negotiates between them and the Dutch government.

The languages and literature of Celebes differ essentially from those of the countries to the west. The letters of its alphabet are in form as unlike the Javanese as the latter are unlike the Arabic or Roman. The three great languages of the island, not reckoning the dialects of the savage tribes, are those of the Bugis, the Macassars, and of Mandhar. The modern Bugis is the most cultivated and copious; the Macassar is simpler, and its literature more scanty; both are distinguished for a soft and vocalic pronunciation. The Bugis have a considerable body of literature. The more civilized inhabitants profess Mohammedanism; but previous to the introduction of that faith, the Hindus had brought their religion to the island.

The island of Celebes was first visited by the Portuguese in 1512. In 1607 the Dutch entered into commercial relations with Macassar, and gradually acquired and extended control until, early in the 19th century, they made their supremacy complete. The population is estimated at nearly 2,000,000.

Cel'eres, a body of horsemen traditionally said to have been introduced by Romulus, and to have numbered 300, consisting of citizens rich enough to furnish a horse. They are also described as subdivided into three centuries, under the name of Rammes, Titienses, and Luceres. The number of the centuries of the Celeres is said to have been raised to six by Tarquinius Priscus, this being the origin of the equites or knights, who in after times formed a separate class of citizens.

Celeriac, sē-lěr'ĩ-āk. See CELERY.

Cel'ery, a biennial or annual herb (*Apium graveolens*), of the natural order *Umbelliferae*. It is a native of Europe, Asia, and Africa, in the older civilized parts of which it was cultivated prior to the Christian era. In nature the plants are commonly found in moist ground, where they attain a height of from 6 to 15 inches. They have numerous leaf-stalks odd-pinnate leaves, and branching leafy flower-stalks two to three feet tall and bearing many small umbels of small white flowers which give place to seeds (fruits) so small that 60,000 or more are needed to weigh an ounce. Cultivated celery does not differ in general characteristics from the wild plant, but by cultivation its leaf stalks (the part desired for the table) have been made more solid, less stringy, and more agreeably flavored. In many instances, too, they have been lengthened or increased in number, and made to form more compact plants. Celery is usually blanched and eaten raw with salt, but often it is used as a cooked vegetable, and its leaves, roots, or ground seeds are frequently used for flavoring. Celeriac or turnip-rooted celery is largely grown in Europe, but little in America. It does not require blanching, but is otherwise cultivated like celery.

Celery is usually started in unheated beds, and the young plants set out in the field when a few inches tall, after being transplanted once or sometimes twice. The soil best suited to the plant is a rich, friable, peaty loam well supplied with moisture, but well drained. As the plant is a gross feeder abundant manure must be given. Celery will, however, do well in any

CELESTE — CELESTINE IV.

moist, rich garden soil. In one method of growing, the plants are set about six inches apart in rows spaced from three to four feet, and the ground is kept loose and free from weeds by frequent cultivation, the plants being gradually covered with earth, or "earthed up," as they approach edible size, or they may be blanched by shading the stems with boards, straw, etc. In another method they are set closer together in the rows, which are rarely more than 12 inches apart. The size of the variety is a governing factor in the matter of distances; some varieties grow only 12 or 15 inches tall, others more than two and a half feet. In this "new celery culture" no earthing-up is necessary, as the plants blanch themselves. Summer celery is blanched quickly by the former method; autumn and winter celery more slowly. Indeed, the process is frequently continued in the winter storing quarters, which usually consist of specially constructed houses or cellars, the floors of which are covered with a few inches of earth, in which the roots obtain some food and water.

Celery is frequently attacked by parasitic diseases, but most of its insect enemies are controlled by parasites and rarely become troublesome enough to demand special attention. The chief fungous parasites are sun-scald or rust (*Cercospora apii*), which appears upon the leaves as yellow or gray blotches which enlarge and gradually destroy the whole leaf. It is more frequent on plants grown in dry soils. Leaf-blight (*Septoria petroselinapii*) appears on the leaves and stems as watery spots which become dotted with black spores. These parasites may be controlled by spraying with a standard fungicide (q.v.). Several other parasites are occasionally troublesome, but they can usually be similarly controlled.

In the United States the celery industry developed enormously during the closing quarter of the 19th century. From being restricted to the individual gardens and fields of market gardeners who grew it as one of their ordinary crops, it has in many localities become a specialized business, with machinery adapted to its particular needs. And from demanding only part of the time of the market gardener it now occupies the attention of hundreds of men in certain districts. In Michigan, California, and New York there are thousands of acres devoted to this crop, and from some of these districts hundreds of carloads of celery (even trainloads from California) are sent to Chicago, St. Louis, Kansas City, New York, Boston, Philadelphia, and other large distributing centres. Instead of having celery as a delicacy for a few weeks during autumn and winter, American tables are supplied throughout the year with this vegetable, which has risen to the rank of a necessity, a development due mainly to improvements in the management of the crop, but partly to improved transportation and storage methods.

In medicine celery enjoys a certain popular reputation by reason of the apiol which it contains. This has an action similar to that of many of the volatile oils, but in addition it dilates the blood vessels, particularly of the pelvic viscera and is, therefore, useful in disorders of menstruation, in chronic constipation, and disordered intestinal states in general. It is also diaphoretic and diuretic.

Consult Greiner, 'Celery for Profit'; Van Bochove, 'Kalamazoo Celery'; Hollister, 'Liv-

ingston's Celery Book'; Duggar and Bailey, 'Notes Upon Celery'; 'Cornell University Agricultural Experiment Station Bulletin' 132; Bailey, 'Cyclopedia of American Horticulture.'

Celeste, se-lĕst, **Madame**, French actress: b. Paris 6 Aug. 1814; d. there 12 Feb. 1882. A pupil at the Conservatoire, she early showed remarkable talent. She made her début in 1827 at New York, and during her residence in the United States married a Mr. Elliott. At Liverpool, in 1830, she played Fenella in 'Masi-niello'; in 1831-3, she became extremely popular in London. Her second visit to the United States (1834-7) is said to have brought her \$200,000. After her return she took part successively in the management of the Theatre Royal, Liverpool, and the Adelphi and Lyceum in London. Her imperfect English long confined her to non-speaking parts. She retired from the stage in 1874.

Celes'tial Empire, The, a popular name for the Chinese Empire, taken from the Chinese appellation for the country, "Tien Chao" (Heav-enly Dynasty). Hence the name "Celestials," applied to natives of China.

Celestial Sphere, the skyey background on which all celestial objects appear projected. It is supposed to be of indefinite radius, with the observer at the centre. It is crossed by systems of imaginary circles which serve to fix positions upon its surface by means of spherical co-ordinates. See CO-ORDINATES.

Cel'estine I., Saint, a Pope memorable in the annals of the Church as having convoked the general council of Ephesus, 431; as having given to Palladius and Patricius mission to the Irish and the Caledonians, and as having checked the progress of Pelagianism and Nova-tionism. Of his birth or his age there is no record, but he died in 431 and his day in the Roman calendar (that is, the day of his death) is 7 April: he occupied the see of Peter about eight years and a half. Celestine was represented in the Ephesine council by his legates, and at his instance the council condemned the heresy of Nestorius; and of his letters to bishops of various churches both in the East and the West, communicating to them the council's decrees, four are extant, namely: those to the African bishops and to the bishops of Illyria, of Thessalonica, and of Narbonne.

Celestine II., Pope (Guido di Castello): b. Tiferno, Tuscany; d. Rome March 1144. He had studied under Abelard, and succeeded Innocent II. in 1143. It was this pontiff who granted absolution to Louis VII. of France, and removed the interdict which for three years was laid upon that country.

Celestine III., Pope (Giacinlo Orsini): b. about 1106; d. Rome 8 Jan. 1198. He succeeded Clement III. in 1191, when, it is believed, about 90 years of age, and reigned till 1198. He crowned the emperor Henry VI. of Germany in 1191, but afterward excommunicated both Henry and Leopold, duke of Austria, on account of the captivity of Richard Cœur de Lion.

Celestine IV., Pope (Goffredo Castiglione): b. Milan; d. 22 Sept. 1241. When a monk at Hautecombe in Savoy, he wrote a history of Scotland. He was elected Pope in 1241, but reigned only 17 days, having died, it is said,

CELESTINE V.—CELIBACY

of poison before the ceremony of consecration was performed.

Celestine V., Saint, a Pope celebrated as the one occupant of the papal see who, his title undisputed and no demand made for his retirement, voluntarily and of his own motion abdicated the pontificate. He was a Neapolitan, born in 1215, and while a lad entered the order of Benedictines. From the first he practised the greatest austerities, and at the age of 24 years, for the sake of freedom in the pursuit of religious perfection, he quitted the monastery and adopted the solitary or eremitical life in a cave of Mount Morone, whence his surname, Peter di Morone. After five years spent in this solitude he, with two companion hermits, migrated to a similar cave in the Monte di Majella in Bruttium. Here disciples flocked to him in scores, and to these he gave a rule of life and thus laid the foundation of a new monastic order which later received papal approval; after the death of the founder the order assumed the title of Celestines. While Peter di Morone was, as superior-general, governing 36 communities of the new order comprising 600 monks, he was elected Pope 7 July 1294. He protested vigorously against this unexpected promotion, but at last was prevailed upon to assume the burden of the papacy. As Pope he promulgated two decrees, one re-enforcing the rule which requires that the cardinal electors of a Pope shall be strictly secluded in the conclave; and the other that a Pope may lawfully and validly lay down his office. At the end of five months and eight days he acted on this definition and abdicated, out of a desire, as he publicly declared, "for humility, for a purer life, for a stainless conscience, and in view of his lack of physical strength, his ignorance, the perverseness of the people, and his longing for the tranquillity of his former life." All eminently strong and good and honorable reasons, and worthy of the sincerely religious soul that was moved by them. His successor in the papacy, Boniface VIII., doubtless fearing lest the honest hermit should repent of his abdication and resume the papal title, made him a prisoner and confined him in a strong castle where he died, after languishing 10 months, 19 May 1296. Some commentators of Dante ('Inferno,' iii., 60) think that Celestine is the damned soul,

Who to base fear
Yielding, abjured his high estate,

(Cary's trans.), or as the verse is rendered by Longfellow —

The shade of him
Who made through cowardice the great refusal.

But as has been well remarked, "Dante knew better than to consign a man to eternal pain for having declined the path of ambition." Celestine V.'s day in the Roman calendar is 19 May, but he is there styled not simply Saint Celestine, but Saint Peter Celestine (Petrus Cœlestinus). His canonization took place 11 years after his death. See CELESTINES.

Cel'estine, in mineralogy. See CELESTITE.

Cel'estines, a monastic order of the Roman Catholic Church, a branch of the great Benedictine order. It was founded by Pietro di Morone, afterward Pope Celestine V. (q.v.). To Pietro di Morone, who was leading an eremitical life in a wilderness, so many men re-

sorted for spiritual guidance that he was induced to form them into a religious community under a rule drawn up by himself. The institute was approved by Pope Urban IV. in 1264, 10 years after it had been founded, but not as an independent order, for it was made a branch of the Benedictines, under a rule based on the rule of that order. The mother house of the institute was on Monte Majella in the Abruzzi, and 30 years after it was affiliated to the Benedictine order its primacy was acknowledged by 36 establishments having 600 members. The founder now relinquished the office of superior-general and resumed his former eremitical life. After Pietro was made Pope Celestine the order, till then known as Hermits of Saint Damianus and popularly as Moronites, took the name of Celestines. The order spread throughout Italy and beyond the Alps to France, Germany, and Flanders: so strong was its French branch early in the 15th century that it obtained for itself from the popes bulls that made it in a measure independent of the superior-general. But in the 17th century the order was already in process of rapid decay, and in the 18th many of its establishments were dissolved by papal decree, and many more by the secular powers. The order is now extinct.

Cel'estite, a native form of strontium sulphate, SrSO_4 , crystallizing in the orthorhombic system, and also occurring in fibrous and radiated forms. The crystals resemble those of barite, and are usually tabular or prismatic. They have a hardness of from 3 to 3.5, and a specific gravity of 3.96. Celestite is commonly white with a vitreous lustre, but it also occurs with a pronounced bluish tinge, from which circumstance it received its name. When found in quantity it is a useful source of strontium. Fine crystals of it occur in the limestone about Lake Erie. Other important localities are in Sicily, Hungary, England, Canada, West Virginia, and California. Varieties containing large amounts of calcium or of barium are called calciocelstite and barytocelstite respectively; and the mineral itself is often called celestine.

Cel'ibacy, the state of being unmarried; especially the voluntary single life undertaken by religious devotees and by some clerical orders, as those of the Roman Catholic Church. Paul (1 Cor. vii.) recommends virginity, without condemning matrimony. The Roman Catholic Church respects matrimonial chastity, but esteems virginity a higher virtue.

From the time of the apostles it became a custom in the Church for bishops, priests, and deacons to renounce matrimony at their consecration, and to devote themselves entirely to the duties of their office. One point only was disputed, whether clergymen were to be merely prohibited from marrying, or whether even those who were married before their consecration should be required to separate themselves from their wives. At the Council of Nice several bishops proposed that the bishops, priests, and deacons who had received the holy consecration, should be directed by an express ordinance to give up their wives. But Paphnutius, bishop of Upper Thebais, contended that cohabitation with a wife was a state of chastity. It was sufficient, he said, according to the ancient traditions of the Church, that men in sacred orders should not be permitted to marry; but he who

CELL

had been married before his consecration ought not to be separated from his lawful wife. As it became the general opinion that a clergyman could not marry, it soon became the general practice to refuse consecration to married men. By this means uniformity was effected. As for the bishops, it soon became a matter beyond dispute. When monachism had become firmly established, and the monks were regarded with veneration on account of their vow of perpetual chastity, public opinion exacted from the secular clergy the same observance of celibacy. Epiphanius assures us that by the ecclesiastical laws celibacy was commanded, and that wherever this command was neglected it was a corruption of the Church. The Council of Elvira commanded all bishops, presbyters, deacons, and subdeacons to abstain from their wives, under penalty of exclusion from the clergy. In the Western Church celibacy was rigorously required. Pope Siricius, at the end of the 4th century, forbade the clergy to marry, or to cohabit with their wives if already married. At the same time the monks received consecration, which increased the conformity between them and the secular clergy still further, and indirectly obliged the latter to observe celibacy. The Emperor Justinian declared all children of clergymen illegitimate, and incapable of any hereditary succession or inheritance. The Council of Tours, in 567, issued a decree against married monks and nuns, declaring that they should be publicly excommunicated, and their marriage formally dissolved. Seculars, deacons, and subdeacons, who were found to dwell with their wives, were interdicted the exercise of spiritual functions for the course of a year. In Spain, where many priests refused to conform to the requirements of the Church, the bishops were ordered to enforce celibacy upon their abbots, deacons, etc., once a year in their sermons.

As in other points of discipline, in this also the Greek Church dissented from the Roman. The (Trullan) Council of Constantinople, in 691, in its 13th canon, declares: "We hereby forbid anyone to refuse the consecration of a priest or deacon on account of his being married, and cohabiting with his wife after he has requested consecration. We will by no means be unjust to marriage, nor separate what God has united." This regulation is still in force. Celibacy is indeed required of the bishops and monks, but priests and deacons, if married before ordination, are allowed to continue in this state. They cannot marry after ordination.

The Roman Catholic Church, then, has retained celibacy as an old apostolical tradition, to which she has added the rule not to consecrate married men unless the wife enter a religious order. As no one has a right to demand to be consecrated a priest, the Roman Church has, by this addition, violated no one's right. Her position, therefore, is expressed by saying that, profoundly convinced that an unmarried clergy is best suited to her work, she admits to her ministry only those who voluntarily engage to lead a celibate life, and as long as she finds a sufficient number of such candidates she refuses to hamper her work by the employment of others. While, however, the Church persevered in commanding celibacy, she had to struggle with the opposition of those who among the clergy represented corruption.

A reformer appeared in Gregory VII., who, in order to reform the discipline of the Church, was obliged to encounter simony and licentiousness in some of the clergy. The former he checked by opposing the emperor's right of investiture, and he enforced the laws of celibacy by new regulations. In the Council of 1074, at Rome, he ordered that all married clergymen and all laymen who should confess to them, hear mass of them, or be present at any divine service performed by them, should be excommunicated. This met with much opposition, but in spite of that Gregory succeeded, as he was supported by the most ancient and most undoubted canons. After Gregory's death the Church continued in the same course. Still the question of celibacy has continued down to recent times to be the subject of fresh agitations and contests. All through the first half of the 19th century there were periodical attacks upon this rule of the Church, in which almost every Catholic country of Europe was represented. These movements have occurred alike within the communion of the Church and among secular and political bodies. They have usually been inspired by concern for the welfare of the Church and for the character and perpetuity of its priesthood, but no result has thereby been gained in any alteration of the ecclesiastical discipline.

The rule of celibacy has been more strictly observed in the Roman Catholic Church since the Reformation than it was before. The far greater number of the Catholic clergy have continued to respect it. Among the reasons sometimes urged against requiring celibacy in the clergy is the scarcity of men willing to devote themselves to a profession which calls for such strict self-denial. This, however, is said to be not true in point of fact, since statistics show a marked increase in the number of candidates for the priesthood at the present time.

Cell, the primary element of the bodies of plants and animals. A cell is a microscopic portion or bit of protoplasm (q.v.) either with or without a wall, and with usually, probably always, a nucleus. Cells are originally more or less spherical sacs, and the protoplasmic contents is the cell, that is, its dynamic portion. The cell is the morphological unit of the organic world. The size of cells varies, but they are mostly microscopic, the sperm cell (spermatozoon) being even less than 0.003 mm. in diameter. The egg-cell — for all unfertilized eggs are simple cells — may, as in that of the fowl, goose, or ostrich, be several inches in diameter. The largest unicellular organisms are the giant plasmodia of the *Mycetozoa*. While the free cells are spherical, when they are united into tissues they may by mutual pressure form polygonal or prismatic bodies, or may send out spindle or star-shaped branching processes, or a nerve-cell may send out a long, fine nerve-fibre.

History of the Cell Theory.—The term "cell" was first used in the 17th century by Hooker, Malpighi, and Grew in writing of vegetable anatomy. They had in mind small chambers surrounded by firm walls and filled either with air or fluid. The English botanist Brown discovered the nucleus. Schleiden then framed his cell theory, laying emphasis on the nucleus. While his view was somewhat erroneous,

CELL — CELLARDYKE

Schwann applied Schleiden's views to the animal world, and the cell theory was spoken of as the Schleiden-Schwann theory. From their point of view the cell-membrane was regarded as most important for the function of the cell; but, after that, the conceptions as to the true nature of the cell completely changed. It was seen that the protoplasm was the essential part of the cell. It was observed that it owed its origin to a previous cell, a living mother-cell. Hence Virchow's aphorism, *Omnis cellula ex cellula*. Then followed the discovery of protoplasm (q.v.) by Dujardin, Mohl, Schultze, and others, so that now the cell is regarded as a lump or bit of protoplasm.

Nucleus.—This is the central specialized portion of the cell, and the part in which reproduction begins. The nucleus may vary in shape in each kind of cell. While usually spherical it may be oval, club-shaped, bent into a U, or be branched. It also varies much in size, sometimes forming almost the whole of the cell, but sometimes so small as to be found with difficulty, and only by employment of a special technique. The substance of which the nucleus is composed is distinguished from protoplasm, besides other characters, by its greater coagulability in certain acids (acetic and chromic).

Structure of the Nucleus, Chromatin and Chromosomes.—A portion of the nucleus reacts to certain staining-fluids (carmines, hæmatoxylin, and safranin); this is therefore called "chromatin" (by some "nuclein"). The other substance, which does not stain, or only under special conditions, is called achromatin or linin. The chromatin forms a honeycomb structure (by other authors regarded as a network or reticulum) filled with a nuclear fluid, bounded externally by a nuclear membrane.

The chromatin enters into close relations with a less stainable substance, the plastin or paranuclein, also sharply distinct from achromatin. In the nuclei of *Protozoa*, plastin and chromatin are usually intimately united, the latter being embedded in the plastin. Both of these substances are usually so closely and regularly distributed as fine granules on the reticulum that the entire nucleus appears to be uniformly chromatic. The mixture sometimes collects into one or more special bodies called the chromatic nucleoli. The nucleolus is usually a rounded body (Hertwig).

In the *Metazoa*, or many-celled animals, the plastin (apparently not the whole, but a surplus) is separate from the chromatin. Thus there occur, in the nuclei of many eggs, nuclei which contain, the one chromatin, the other exclusively plastin.

Significance of the Cell Nucleus.—It is now well known that the seat of the reproduction process is in the nucleus. It has lately become apparent that the nucleus determines the character of the cell, and, again, that it is also "the bearer of heredity" (see HEREDITY). Within the nucleus the chromatin is now supposed to control the functions of the protoplasm, and therefore is the bearer of heredity, while the achromatin is the seat of contractility, and as such plays a part in cell-multiplication (Hertwig).

The Centrosome.—In addition to the nucleus there frequently occurs a special body in the protoplasm, called the "centrosome." It is supposed to be a derivative of the nucleus, either

a part of the achromatin which has left the nucleus; or a second nucleus which by degeneration has lost the chromatin and retained only the active nuclear substance, the achromatin. The centrosome functions as a specific organ of cell-division which controls both the division of the nucleus and that of the cell itself. See KARYOKINESIS; MITOSIS; PROTOPLASM; REPRODUCTION.

Consult: Hertwig, 'The Cell'; 'A Manual of Zoology'; Wilson, 'The Cell in Development and Inheritance.'

Cell, a small chamber; the dwelling of a hermit; a lesser or subordinate religious house dependent upon a greater, by which it was erected, and under whose government it remained. The apartments or private dormitories of monks and nuns are also called cells.

Cell, in mechanics. See PEAUCELLIER CELL.

Cell Electrical. See BATTERY.

Cella, the windowless hall or central apartment of a Greek or Græco-Roman temple. This was often divided into two chambers of unequal size; the naos, in which was the statue of the divinity for whose worship the temple was built, and the thesauros or treasury. The cella was formerly supposed to have been roofless, or partially roofless, but later scholars believe it to have been lighted only through the doors or by artificial light. In the larger temples the roof was internally supported by the rows of columns in the cella, frequently in two superposed ranges.

Cellamare, Antonio Guidice, än-tō'nē-ō gē-dē'chā thāl-yä-mä'rā, PRINCE OF, Spanish ambassador: b. Naples 1657; d. Seville 16 May 1733. He was educated at the court of Charles II. of Spain, and took a prominent part on the Spanish side in the war of Succession. In 1707 he was taken prisoner by the Imperialists, and detained five years in Milan. On obtaining his liberty he returned to Spain, and in 1715 was appointed ambassador extraordinary at the French court. Here, having entered into Alberoni's scheme, he became head of a conspiracy for supplanting the regent, Philip of Orleans, and appointing Philip V. regent of Spain and France. The plot was discovered, and Cellamare was marched off under a guard to the Spanish frontiers. He was afterward made captain-general of Old Castile, and held the office at his death. A romance of Vatout, entitled the 'Conspiracy of Cellamare,' gives an account of the conspiracy with tolerable accuracy.

Cel'lar-snail, a species of land-snail (q.v.) (*Zonites cellaris*). It has been introduced from Europe, and has become common in cellars, hot-beds, and gardens of the seaport towns along the Atlantic coast. The shell is small, much flattened, thin, and has a large umbilicus.

Cel'lardyke, Scotland, a village on the southeast coast of the county of Fife, between Anstruther-Easter and Kilrenny. It is an eastern extension of the former, but is united as a royal borough to the latter. The inhabitants are chiefly engaged in or connected with the fishing industry; the village contains three fishing-gear factories and also oil-skin works. Pop. 1,662.

CELLE — CELLULOSE

Cellier, Alfred, English composer: b. Hackney, England, 1 Dec. 1844; d. London 28 Dec. 1891. He was the son of a French father and an English mother and from 1855 to 1860 was a chorister of the Chapel Royal, Saint James. In 1862 he became organist of All Saints' Church, Blackheath; at 20 he directed the Ulster Hall concerts at Belfast, and in 1868 was organist of Saint Alban's, London. He conducted at the Prince's Theatre, Manchester, 1871-5; and at the Opera Comique, London, 1877-9. Besides much music for orchestra and piano he composed among other operas: 'The Tower of London' (1875); 'Nell Gwynne' (1876); 'The Masque of Pandora' to the words of Longfellow's poem (produced in Boston 1887); 'The Sultan of Mocha'; 'Dorothy' (1886); 'The Mountebanks' (1892). The last named work was produced a week after its author's death.

Cellini, Benvenuto, bān-vā-noo'tō chēl-lē'nē, Italian sculptor, engraver and goldsmith: b. Florence 1500; d. there 25 Feb. 1571. Of a bold, honest, and open character, but vain and quarrelsome, and impatient of encroachment and dependence, he was often entangled in quarrels which frequently cost his antagonists their lives. He himself incurred great dangers, was put into prison, and was saved only by his boldness and the powerful protectors whom his talents as an artist procured him. His autobiography is a production of the utmost energy, directness, and racy animation. The vanity and self-satisfaction displayed throughout the work are excessive and highly amusing. It not only contains a very full information respecting his life and professional pursuits, his amours and hatreds, his passions and delights, his love of art, his extravagances, his self-applause and self-assertion, and describes all ranks of persons with whom he was connected during his strange career, but furnishes a very lively and doubtless a tolerably accurate picture of the state of society during the 16th century. This work has been translated in a masterly manner by Goethe into German. There are also English translations, Nugent (1771), revised by Thomas Roscoe (1822); and Symonds (1887). Among his other writings the most important are 'Due Trattati uno intorno alle Otto Principali Arti dell' Oreficeria l'altro in Materia dell' Arte della Scoltura' (best edition 1731). His 'Opere' were published at Florence in 1843. Prominent among his statues are 'Perseus with the Head of Medusa' and the 'Nymph of Fontainebleau.' Consult: Symonds, 'The Renaissance in Italy' (1885); Leader Scott, 'Sculpture, Renaissance and Modern' (1886).

Cell'ites, or **Alexian Brothers**, a religious order, so called from their patron saint Alexius, and from *cella*, tomb, from the fact that their life often leads to an early grave. The brotherhood arose in Mechlin about 1300, to check the ravages of the "black death," and soon spread through Germany, Brabant, and Flanders. At first the Cellites were merely a pious society, intended to harbor the poor and indigent free of charge, to serve the sick, and bury the dead. In 1469 they were organized as a religious order, and, favored by the popes, they established houses in many parts of Europe. In the United

States, they have a hospital in each of the following cities: Chicago (founded in 1861); St. Louis (1869); Oshkosh, Wis. (1880); and Elizabeth, N. J. (1893).

Cel'luloid, an artificial substance extensively used as a substitute for ivory, bone, hard rubber, coral, etc., having a close resemblance to these substances in hardness, elasticity, and finish. It is composed of cellulose or vegetable fibrine reduced by acids to gun-cotton. To this, camphor is added, with the required coloring matter, and the mixture, after being condensed in cylinders, is then molded by heat and pressure into various useful and ornamental articles.

Cel'lulose, a chemical substance closely allied to starch, which occurs in all plants, and is the essential constituent of the walls of the cells. It is especially prominent in young plants, and with age it becomes more or less completely converted into lignin and other analogous products. Cotton fibres are composed almost entirely of cellulose, and such other substances as they do contain are readily removed by treatment with alkalis, alcohol, ether, etc. Cellulose has the chemical formula $n(C_6H_{10}O_5)$, and is therefore a carbohydrate. In some respects, it is widely different from starch, but in others it resembles starch very closely. It may be said, in general, that the chemistry of all the substances that are intimately related to the starches, gums, and sugars is still very imperfectly known. Cellulose is specially remarkable for its insolubility and its chemical stability. It may be decomposed and caused to enter into combination with other bodies, but the only solvent known, which will dissolve it without destroying its chemical identity, is an ammoniacal solution of cupric oxide. From its solution in this menstruum, cellulose may be again precipitated in apparently unchanged chemical form, though in a physically amorphous condition. Unglazed paper (which is nearly pure cellulose) is converted, by the action of strong sulphuric acid, into a parchment-like substance that is known as vegetable parchment, or parchment paper. By the action of a mixture of strong nitric and sulphuric acids, cellulose is converted into a sort of nitrate, which is commercially known as gun-cotton (q.v.). Collodion is a solution of gun-cotton in a mixture of ether and alcohol. By the prolonged action of sulphuric acid cellulose is partially converted into glucose, and various other reactions are also known with sulphuric acid according to the conditions under which the experiment is made. When strongly heated out of contact with the air cellulose is destroyed, with the formation of acetic acid, methyl alcohol, and many other products. These transformations occur in the distillation of wood in the manufacture of wood alcohol. (See ALCOHOL.) It is probable that true cellulose occurs only in plants; but a substance that is closely analogous to it, and which is believed by some authorities to be identical with it, is found in the tissues of ascidia and other molluscos animals.

Cellulose as prepared from corn pith is now used to a considerable extent in ships of war, to prevent the entrance of water through shot-holes. For this purpose it is disposed within the steel hull along the water line, in the form of a belt some three feet in thickness. For several years a packing of cocoa fibre was used in this

way, but corn pith is now preferred, and is used on the Kearsarge, Alabama, Kentucky, and Illinois. The great superiority of the corn pith lies in the fact that as soon as the water reaches it the pith swells and automatically closes the shot-hole.

Celma, a Thessalian woman, who, with her husband, Celmus, was changed into adamant for denying the immortality of Jupiter.

Celman, Miguel Juarez. See JUAREZ, CELMAN.

Celsius, sěl'sī ūs, the name of a Swedish family, several members of which attained celebrity in science and literature: 1. **MAGNUS CELSIUS**: b. in the old province of Helsingland, 1621; d. 1679. He became professor of mathematics in the University of Upsal and published two works on the antiquities of his native province and was the discoverer of the Helsing runes. Besides mathematics and archæology, he cultivated poetry with some success, and was so skilled in practical mechanics that he himself made all the scientific instruments he required in his astronomical observations, etc. 2. His son, **NILS CELSIUS**: b. 1658; d. 1724; also filled the mathematical chair in Upsal University. 3. **OLAF CELSIUS**, another son of Magnus: b. 1670; d. 1756. He early became famous as an earnest student of the Oriental languages and of botany. He was successively appointed to the chairs of Greek, Oriental languages, and theology, and filled the office of provost of the cathedral at Upsal. He devoted a good deal of attention to the study of runology, and was among the first to recognize the genius of Linnæus, whom he liberally patronized. In 1745-7 he published his voluminous work 'Hierobotanicon,' a description of all the plants mentioned in the Bible. 4. **ANDERS CELSIUS**, son of Nils Celsius, and the most distinguished of the family; b. 27 Nov. 1701; d. 1744. After being appointed professor of astronomy at the University of Upsal, he traveled in Germany, England, France, and Italy; and in 1736 took part in the famous expedition that was undertaken by Maupertuis, Clairaut, Camus, and others, for the purpose of measuring a degree of the meridian in Lapland. For his services in this expedition he received a pension from the French king. He is best known at the present day as the constructor of the Centigrade thermometer. 5. **OLAF CELSIUS** the younger, son of the Orientalist and naturalist, and cousin of the preceding: b. 1716; d. 1794. He became Bishop of Lund, and devoted himself to history and poetry. His principal historical works are: 'Ecclesiastical History of the Kingdom of Sweden'; 'History of Gustavus I.'; 'History of Erik XIV.'

Cel'sius Scale, the Centigrade thermometric scale. The name is from that of the inventor, Anders Celsius, who about 1741 attempted the precise graduation of thermometers. He took the melting-point of ice as 0°; and the boiling-point of water, under standard atmospheric pressure, as 100°. See THERMOMETER.

Cel'sus, pagan philosopher, an antagonist of the Christian religion in the second century. He is believed to have been the same Celsus, friend of Lucian, to whom is inscribed Lucian's satirical sketch of the life of the noted impostor and pseudo-thaumaturgus Alexander of Abono-

tichus, entitled 'Pseudomantis.' No work of Celsus has come down to us in its integrity or in its original form, but his 'True Discourse' is in substance preserved for us in the eight books of Origen's computation of the arguments brought by Celsus against the truth of the religion of Christ: Origen quotes textually long passages from the 'True Discourse' in his work 'Against Celsus.' From these passages it is seen that Celsus had accurate knowledge of the religious creed and practices, both of the Jews and Christians, and he skilfully puts in the mouth of a Jew his criticism of the life of Jesus as told in the gospels. Celsus himself appears to have been an epicurean and a scoffer at the supernatural, while his Jew is a firm believer in miracle, but for all that he cannot accept the gospel stories. He rejects the doctrine of the Incarnation of God, and reports a scandalous story of an amour which he offers as a substitute for the evangelists' narrative: and the fact Origen quotes the passage containing this shockingly blasphemous suggestion (as it must have been regarded by him) is evidence that the Christian polemist is dealing fairly with his antagonist. According to Celsus Jesus once visited Egypt and there learned the art of the jugglers; in his own country he easily won reputation as a wonder-worker, even a god. By his jugglery he might have made the multitude present at his immersion by John in Jordan believe that they heard a voice from heaven. If he was God, he would have made a better choice of apostles: why did he choose Judas? The story of the resurrection is self-contradictory. His death by crucifixion is undisputed and was a fact of public notoriety; if he rose from the dead, why did he not make that fact equally notorious and public? With such objections Celsus attacks the Christian faith in the first half of his work; in the second half he speaks in the person of a Grecian philosopher. Whatever is true and good in the Christian system exists already in the schools of philosophy: therefore let the Christians abandon their narrow sectarianism and separatism, and combine with all good and wise men in upholding the principles of good government. Celsus then advances philosophical arguments against the credibility of the Christian mysteries, in particular the Incarnation. God cannot assume a mortal body either in reality or in appearance only: not really, for that would be contrary to his nature; not in appearance, for that would be a fraud. But the idea of an incarnation of God is absurd: what could be gained by an incarnation? Certainly no advantage for God; but neither for men: do men know God better for seeing him in bodily form? Did God a little while ago waken from sleep and resolve to save a few men from sin, leaving the mass of mankind to go down to hell?

Celsus, Aurelius, or **Aulus Cornelius**, Latin writer on medicine who lived, probably, under the reigns of Augustus and Tiberius. He has been called the Roman Hippocrates, because he imitated the Greek physician, and introduced the Hippocratic system into Rome. He also wrote on rhetoric, the art of war, and agriculture. He is, however, best known as a medical writer. His style is elegant, and though concise, is very perspicuous. His work on medicine is an inexhaustible source from which other authors have

CELTES — CELTIC LANGUAGES

drawn materials. Eighty editions of his eight books 'De Medicina' have appeared; the first at Florence (1478). There is an English translation by Grieve (1756), and an edition, Latin and English, by Lee (1831). The edition by Védrenes (Paris 1876) contains a French translation. The standard text is that of Daremberg (Leipsic 1859).

Celtes, tsel'tes, **Konrad**, German humanist: b. 1459; d. 1508. His most celebrated work is a volume of 'Odes' (1513). He did much to promote the study of the classics.

Celtiberi, a people of ancient Spain, supposed to have arisen from a union of the aborigines, the Iberians, and their Celtic invaders. Various limits have been assigned to their country, which included probably all the north of Spain as far south as the sources of the Guadalquivir. Hannibal subdued the Celtiberi, and they afterward passed under the Roman yoke. They revolted in 181 B.C., and were subdued by Tiberius Gracchus 179 B.C. Two struggles for independence followed, called respectively the first Celtiberian Numantine, and the second Celtiberian or Sertorian wars, in the latter of which they were finally vanquished, and after 72 B.C. do not again appear in history.

Celtic Church, the designation specially appropriated to the Christian Church founded in North Britain among the Celtic population by Ninian, Columba (Columcillé) and other Celtic apostles. Of these the most notable is Columba. He was a native of Ireland and a scion of the royal line of Niall and a kinsman of Conal, king of Ailbe or Albin, later called Scotia. Columba and all his companion missionaries to the Scots and Picts were monks, and the churches he and they founded, whether on the mainland or in the Western Isles, were essentially monastic in their form of government. In the Holy Isle, Iona, called also after the name of the Gaelic apostle, Hy-Columcillé, which was the metropolis of Celtic or Gaelic Christianity, Columba was arch-abbot of all the monastic communities and in effect, though not in order or title, bishop, primate and patriarch of that whole province of the Church Catholic. The system of Church government was not diocesan, and though there were bishops in Scotia they appear to have simply exercised their spiritual and sacramental powers in conferring orders and performing other rites. The government of the Celtic Church appears to have been administered only by the arch-abbot and his subject abbots. The Church spread, not by the erection of parishes, but by the planting of monastic houses, and a monastic community usually consisted of members of a clan, thus of kinsmen one of another. Columba himself had among 11 successors in the primacy 9 who were his kinsmen. These Gaelic monks lived under a rule drawn up for them by men of their own race, but in imitation of the early rules of the eastern cenobites. The chief precepts of the Celtic monastic rule were poverty, chastity, obedience, and hospitality. The day of Easter was observed according to the Eastern cycle, and in this the Celtic Church of Scotland was at variance with the Latin Church. They had also some peculiarities in the mode of administering baptism. Columcillé came among the Scots in 563, being then aged about 40; he lived till the close of the century. From the end of the 6th to the end of the 8th century Hy-Columcillé or

Iona was one of the most famous sanctuaries of western Christendom; the Norse pirates laid Iona waste with fire and sword in 795; again in 802; and the ravages were repeated often afterward. Toward the end of the 11th century Margaret, queen of King Malcom Canmore, introduced into the Celtic Church of Scotland the usages of the Church of Canterbury in the observance of Lent and of Easter, in the celebration of the mass and other points of ritual; also she procured to be forbidden marriages between persons related by affinity. In these reforms she was aided by Lanfranc, Archbishop of Canterbury. The only monument of the ancient Celtic Church still extant in Scotland is (the insignificant ruins in some of the Hebrides not reckoned) the chapel raised in memory of the good Queen Margaret on the castle rock in Edinburgh. See IONA.

Celtic Languages, The. These constitute one of the seven or eight main groups comprised in the great family of Aryan or Indo-European languages: thus the Celtic is a sister language of Sanskrit, Old Persian, Armenian, Slavonic, Lithuanian, etc., as well of the Latin, Greek, Teutonic, and of the dominant modern languages of Europe. Within historic times Celtic speech prevailed throughout western Europe. As late as Cæsar's time it was the language of northern Italy, then known to the Romans as Gallia Cisalpina or the land of the Gael south of the Alps; and at that time Celts, Gaels or Gauls occupied the whole of the region lying west of the Rhine and part of Switzerland, besides the British Isles. But in time Celtic speech was wholly detruded from its seats throughout western continental Europe except the western extremity of France, and in the British Isles at the time of the Norman conquest it had disappeared from the whole southern half of Britain except Wales and Cornwall, and survived only in northern Britain, Ireland, Man and other isles of the Britannic group.

The language of these Celtic peoples, as well in antiquity as at the present time, presented dialectic differences sufficient to warrant a division of their common speech into two groups, the Gaelic, now represented by the Celtic speech of Ireland, Scotland, and Man; and the Cymric or Kymric, represented by the Celtic speech of Wales and Brittany. Of these two groups the Cymric has best withstood the intrusion of alien speech, whether Romanic or Teutonic; and to this day a Cymric dialect of Celtic is the language of the people of Brittany and Wales; while of the provinces of the Gaelic tongue, Scotland, with a population of about 4,500,000, has not in the mainland or in the isles more than 300,000 persons who speak or understand Gaelic; and in Ireland in 1900, when the population was 4,500,000, the speakers of Gaelic were but 700,000, a decline of 50,000 from their number 10 years before. This decline is due to the large emigration in the last few years from the western province, the last foothold of Gaelic in Ireland. But the people of Ireland and the children of Ireland abroad are now making a concerted effort to resuscitate the ancient speech of their race and to make it again the home-speech of the people, concurrently with English. High hopes are entertained of the success of this movement, which purposes a revival, not only of the Gaelic speech but of Celtic art, and music,

CELTIC LANGUAGES

and literature. It is a struggle for the supremacy of Gaelic ideals in the spiritual life of the people. In 1902, in a convention of the Gaelic League in Dublin, 475 branches of the League were represented. The membership of the branches amounted to 50,000. Gaelic is now taught in 1,600 schools in Ireland, and there were that year several Gaelic periodicals, and nearly every newspaper in Ireland had a column or a page printed in Gaelic. There were 600 Gaelic literary and musical compositions entered in a prize competition held at Dublin during the convention, to which resorted thousands of visitors from all parts of Ireland and from abroad. Such competitions have long been held by the Cymry of Wales.

The Celtic speech of the Britons, now represented only by the Cymric of the Welsh, was formerly the language of the inhabitants of Cornwall and of Strathclyde also, and it is closely akin to the Armoric, or language of Brittany. In the last quarter of the 18th century died the last person for whom the Celtic speech of Cornwall—the Cornish—was a living language. Very scanty remains exist of the poetry of the Celtic inhabitants of Cornwall. What treasure of poetical compositions or of mythic history may have been held in the memory of their bards or of the people is lost, with the exception of five or six poems in the vein of the mysteries of mediæval times, namely: The 'Poem of the Passion,' a versified account of the life of Jesus Christ in the "holy week"—it is probably of the 15th century; 'Ordinalia,' a dramatic trilogy, the first member of which recounts man's history from the creation to the deluge, and then presents the story of Moses, of David, and of the temple of Solomon. The poet or dramatist has no regard for chronology, and makes the temple the theatre of the martyrdom of the Christian virgin Maximilla by the bishop in charge. The second member of the trilogy represents the life of Christ from the temptation by the devil to the crucifixion. The third is a free version of the story of the resurrection and ascension of the Lord, with a supplementary act representing the death of Pilate as told in mediæval legends. Dramatic unity is obtained by interweaving a myth regarding the wood of the cross, a favorite extravaganza of mediæval fancy. Another play is 'The Life of Saint Meriasek' written in 1504, a jumble of historical and traditional personages and occurrences crowded together with no regard whatever to chronology or probability or even possibility. But in the tangle are found some passages of considerable literary merit. Besides these dramatic pieces there survive a few songs, proverbs, epigrams, and the like, and the tale of 'John of Chy-an-Hur,' a favorite folk-tale.

Welsh, or Cymric (Kymric), the language of the Cymry or Kymry, is both a living language and has a literature of considerable volume and of no mean literary value. A few of the peculiarities of Cymry speech which distinguish it from the kindred speech of the Gæl, as regards the phonology, are that in Welsh *p* (labial) answers to *c* (*c* hard, equal to *k*) in Gaelic; *e.g.*, Welsh *pren*, tree, *petguar*, four, *plant*, progeny, answer to Gaelic *crann*, *cethir*, *cland*, respectively; or, Welsh *nep*, *map*, *paup* to Gaelic *nech*, person, *mac*, son, *cach*, each, respectively. Even proper names from Gaelic sometimes undergo this change on coming into Cymry speech: *e.g.*, the

celebrated Irish saint, Kiaran (Ciaran, the *c* being always equal to *k*) is in Cymric Piaran; but conversely the word *Pasch* (Pascha, pass-over) is in Gaelic *casg*, and Latin *purpura*, allied to Gr. *pyr* or *pur* and to Eng. *fire*, is in Gaelic *corcur*. Answering to Gaelic *iasg*, which is Gr. *ichthys* and Eng. *fish*, Welsh has *pysg*, as Latin has *piscis* (*c* = *k*). In Cymry the sibillant *s*, preserved in Gaelic, Latin, etc., is often displaced by *h*, as is the case in Greek also, *e.g.*, Eng. salt, Lat. *sal*, Gæl., *salann*, but Welsh *halen*, Gr. *hals*. Other differences of this sort between Welsh and the sister language Gaelic might be instanced, but these suffice.

Many Welsh MSS. from early times are extant—poems and prose romances chiefly, and they relate to the period of the Roman occupation, of the wars with the Sassenach, and the wars with the kindred Gæl, or they are collections of proverbs or are religious poems. Probably the most ancient of these compositions do not date from an earlier period than the 13th century, though doubtless they are based on and inspired by bardic and other pieces retained through generations in folk-lore. Among the Cymry, as among the Irish Gæl, the bardic order was recognized as a sort of priesthood and was held in the highest respect, the bard enjoying many special privileges. Thus, in the Laws of Howel Dda (Howel the Good), composed in metre according to primitive usage in all lands, the provisions made for the bard are thus expressed:

In case of fighting the Bard shall play the
'Monarchy of Britain' before the battle.
His land shall be free; he shall have a horse
from the King.
He shall have a harp from the King and a gold
ring from the Queen. The harp he shall
never part with.

Most of the ancient poetry is attributed to the bards Taliessin, Aneurin, Llwywarch, Hen, and Myrddin (or Merlin).

For many hundred years the Cymry in Britain were engaged in a deadly struggle with invading races—the Romans, the Gæl, both Scots and Irish, the Sassenach, the Normans, and the English, being pressed back to the West till finally they were conquered and "pacated" in the time of Henry VII. All this time the Cymry bards and chiefs and people kept alive the lamp of learning and cherished the highly imaginative poetry of their seers; and it is a curious fact that among the remains of their early literature still extant are no fewer than 30 treatises on Cymry grammar and prosody, the most notable of these dating from about 880. It was revised in 1200. The authorship of most of the ancient books as well as the dates are problematical, but the dates assigned by the general consent of Welsh scholars to the principal poets are: Aneurin, 510-60; Taliessin, 520-70; Myrddin or Merlin, 530-600. Some of the poems attributed to these three and others are undoubtedly spurious, and so proved to be on chronological grounds. Thus, though the three poets named lived *ex hypothesi* not later than the beginning of the 7th century, in the works attributed to them are found allusions to theological conceptions and use of theological terms which were unknown till four or five centuries later. The Bible was translated into Welsh in the 16th century by Bishop Morgan, and that was doubtless a powerful agent in preserving in its purity

CELTIC LANGUAGES

among the common people their ancient mother tongue.

The Gaelic speech of Ireland and Scotland has a very peculiar phonology, specially in the "aspiration" and "eclipsing" of consonants. This aspiration, as defined by O'Donovan, is "the changing of the radical sounds of the consonants, from being stops of the breath to a sibilance, or from a stronger to a weaker sibilance." But however correct that definition may be, it gives not to one who has no acquaintance with Gaelic any conception of the effect of what is here called aspiration. A few examples will better show what this peculiarity of Gaelic speech is. In Irish Gaelic, and in Scots Gaelic also, though perhaps some differences exist between the two dialects in this respect, the consonants that are subject to this phonetic change are *b*, *c* (*always* = *k* except when "aspirated"), *d*, *f*, *g* (always hard with the same exception), *m*, *p*, *s*, and *t*. The aspiration is denoted, whether in MS. or in print, by a point over the letter, *e.g.*, *ċ*, or by a *h* after, *e.g.*, *mh*. The effect of aspiration is to change the *b* and also the *m* (*bh*, *mh*) to *v* or *w*, or to a sound between *v* and *m*; example, *ard*, high and *bearna*, gap, give not *ard-bearna* (*ardbarna*), but *ardbhearna* (*Ardvarna*). Similarly *Baile-an-mullaich*, the *m* being changed to *mh*, with the sound of *w* becomes in pronunciation *Ballinwoolly*: the word is the name of a town and is made up of *baile*, town, *an*, of the, and *mullaigh*, possessive case of *mullach*, summit. The aspirated *d* and *g* are in sound about equivalent to *y* in *year*; example: *Annayalla* fairly well represents the pronunciation of *Eanaigh-gheala*. When aspirated, *f* is not sounded at all; example: *Cnoc-an-fhraoigh*, pronounced *Knocan-ree*. *P* aspirated is equal to *f*: *baile-an-phoill*, pronunciation, *Ballinfoyl*. The *s* and *t* aspirated are equal to *h*; example: *drum-shamhuin* is *Drumhawan*, and *Drumhirk* fairly represents the pronunciation of *drumthuirc*. To illustrate the process of eclipsis, "suppression of the sounds of certain radical consonants by prefixing others of the same organ"—a process to which are subject the consonants *b*, *c*, *d*, *f*, *g*, *p*, *s*, *t*, each of which has a special eclipsing letter of its own, one illustration, the eclipsing of *b* by *m*, must suffice: the place-name *mullanamoya* (or as it is written, *Mullaghnamoyagh*) represents *Mullach-na-mboitheach*: here the representation of the sound of the word in English is almost as cumbersome as in the Gaelic.

Nearly all the remains of ancient Gaelic literature, and they are comparatively very voluminous and intrinsically valuable, are of Irish origin, the documents written in the Scots and the Manse dialect being of little or no importance. There exists no evidence that in the Middle Ages there were anywhere, in Scotland, schools or academies or any body of scholars, bards or legists such as existed in Ireland as early as the 6th century; and no document in Gaelic or in Latin, and of Scotch origin has come down to us of earlier date than the 'Book of Deer,' which appears to have been penned in the 9th century, and which contains only "a few notes or memorials" in Gaelic, while the body of the book is in Latin containing the gospels in Jerome's version. The Gaelic poetry of Scotland, as preserved in the memory of the people of the highlands and collected in recent times are the only literary monuments extant of ancient

Scotch bardism. The following verses are found in one of those collections. They show the "aspiration" of consonants as in the Gaelic of Ireland.

Tamhull mòr, mac sheann Tamhuil,
(Great Taval, son of old Taval)
Cha ruigeadh a'mhuir mhòr a ruinse,
(The great sea wouldn't reach his middle)
Cha thàruidh e mach, 's cha thàradh e steach,
(He couldn't get out and he couldn't get in,)
'Us 'n uair a bhitheadh e 's a bheul fodha,
(And when he lay down on his face)
Bhitheadh a dhruim a' sgriobadh an athar.
(His back would be scratching the sky).

There are extant fragments of Gaelic writing penned in the 8th and 9th centuries, namely Gaelic glosses appended to Latin MSS. Among these the canons of an Irish synod held in 684 and some passages from a sermon in Gaelic. In libraries in many continental European countries are many Gaelic texts of early times; but in the library of Trinity College, Dublin, and in that of the Royal Irish Academy, in the Bodleian at Oxford, and in the British Museum, are treasured monuments of a very copious Irish Gaelic literature, by good fortune rescued from the destruction which has overtaken the great mass of Ireland's literary product during the "dark ages" of European history. According to their contents these MSS. are classed as histories, annals, biographies, pedigrees, mythological stories, fairy tales, hero stories, religious and devotional writings, lives of saints, lyric poetry, satire, many of the hero tales and myths being in poetical form. Treatises on law (*Brehon law*) are numerous and there are also medical treatises and some works on natural science. As among the Cymry, so among the Irish Gæl, the bards and the possessors or professors of the liberal arts and of the *arcana* of science human and divine, were a privileged class. As early as the 6th century the liberal professions were well organized, and the schools of Ireland were already sending out graduates of *Ecna*, *Filidecht*, and *Fenechas*, wisdom (or philosophy), poetry and divination—the schools of the *Filidecht* were "schools of the prophets"—and law.

Ireland became in the darkest of the Dark Ages, the 9th, 10th, and 11th centuries the sanctuary of learning, and to her schools students flocked in thousands from Gaelic and Saxon Britain and from the continent, while Irish missionaries carried abroad to the banks of the Rhine, the Elbe, and the Danube, and to the Swiss in their mountains, with the cross, the lamp of learning. The profession of a *Fili* being a highly privileged one, and the *Fili* being numbered by thousands, the poetical and imaginative literature of Ireland was exceedingly voluminous, and though most of it has perished, a very considerable portion remains. Of special value are the numerous glossaries, which have been the means, in the hands of modern scholars, of reconstructing the vocabulary of the language. It is estimated that were the words of all the glossaries collected they would add 30,000 to the words contained in the printed dictionaries of the language. In one of these glossaries, dating from before the year 903, is seen an essay in comparative linguistics, Gaelic words being traced in their relations to the Greek, Latin and Hebrew, the British and the Norse. Very numerous are the remains of Gaelic historical or annalistic writings, and of biography, especially lives of saints: there are the annals

CELTIC LITERATURE — CELTS

compiled before 1088 by an Abbot of Clonmacnoise; the so-called 'Annals of Ulster,' collected toward the end of the 15th century; the 'Annals of the Four Masters,' a compilation made indeed as late as the first half of the 17th century, but which embodies a great number of annals dating from much earlier periods, and which are now lost. The hero-tales relate mostly to the earliest period of which the memory was retained in the traditions of the Gaelic race — the times of the invasion of Cymric Britain and of Caledonia by the Gæl of Eire or Erin, or to the wars at home with the tribes known as Nemed's people (Nemesians), Fomorian, Firbolgs, Tuatha, DéDanann, all of them rivals of the Milesian Gæl. To the legendary story of these wars belong the mythic heroes Finn Mac-Cumhaill (son of Cumhall); Finn's son Oisín (the Ossian of Scots Gaelic, as he is also of Irish Gaelic myth); Niall of the Nine Hostages, a figure that stands upon or within the threshold of veridical history; he met his end in an invasion of Cymric Britain in 405. Of other extant poetical compositions founded on the legendary or the real history of the times between the 5th and 11th centuries are: A metrical life of St. Patrick by Fiacc, a bishop; an elegy on the death of the renowned St. Columcille or Columkill, apostle of the western Scots (d. 597): the antiquity of this elegy, the extant copy of which was made about 1100, is proved by the fact that its language was in the 11th century so obsolete that it had then to be glossed and accompanied by grammatical notes. Of this class of legendary or historical poems there is a long list. Prose romances of history came into vogue in the 11th century: in these are glorified the deeds of the Gaelic heroes of the long struggle with the Danes or Norsemen who for 200 years had been making settlements on all the coasts of Ireland: in them was chiefly celebrated the battle of Clontarf, 23 April 1014, in which a great and decisive victory was won by King Brian Boroihme (pronounced borúeh) — Brian of the cow tribute. There are in collections of Gaelic MSS. treatises on the medical art — an art which appears to have been hereditary, in certain families, who assumed as surname a word denoting the art or its professors, for example, O'Liagh (pronounced oléeh), equivalent to leechson or descendant of the leech; O'Hiceadha, O'Hickey, descendant of the healer. Treatises on the Brehon law or Gaelic system of jurisprudence are numerous, the MSS. dating from the 14th and 15th centuries.

JOSEPH FITZGERALD.

Celtic Literature. See CELTIC LANGUAGES.

Celtic Peoples. See CELTS.

Celtis, a genus of trees of the natural order *Urticaceæ*, closely related to the elm. *C. australis* is the nettle-tree. See NETTLE-TREE.

Celts, or **Kelts**, the earliest Indo-European settlers in Europe according to the common theory. They appear to have been driven westward by succeeding waves of Teutons, Slavonians, and others, but there are no means of fixing the periods at which these movements took place. Herodotus mentions them as mixing with the Iberians of Spain. (See CELTIBERI.) At the beginning of the historic period they were the predominant race in Britain, Ireland, France, Belgium, Switzerland, north Italy, Spain, and elsewhere. The Romans generally called them

Galli, but also Celtæ. They appear to have reached the zenith of their power in the 2d and 3d centuries B.C. Some tribes of them, overrunning Greece, crossed over in 278 B.C. to Asia Minor, and subsequently the name of Galatia was given to the country where they settled, from their name in Greek — *Galatai* (*Keltoi* being also used). They finally went down before the resistless power of Rome, and either became absorbed with the conquering races or were cooped up in the remotest parts of their former domains. At an early date the Celts divided into two great branches, speaking different though allied languages. One of these branches is the Gadhelic, Goidelic, or Gaelic, represented by the Highlanders of Scotland, the Celtic Irish, and the Manx of the Isle of Man; the other is the Brythonic or Cymric, represented by the Welsh, the Cornish, and the inhabitants of Brittany. The Cornish dialect is now extinct. The sun seems to have been the principal object of worship among the Celts, and groves of oak and the remarkable circles of stone, commonly called "Druidical Circles," their temples of worship. Celtic art is known to us chiefly in the many ornamented articles in bronze and other metals which have been preserved, and in several splendidly illuminated manuscripts of the gospels. The earlier specimens are characterized, among other things, by a predominance of elliptic curves and diverging spirals, and their style seems to have been of purely British origin and use. The introduction of Christianity led to a great advance in the ornamentation of metal and other articles, but the chief relics of Christian Celtic art are the magnificent manuscripts above referred to. Their dates range from the 7th to the 9th century, and the finest of them are the 'Book of Kells' (Trinity College, Dublin) and the 'Lindisfarne Gospels' (British Museum). See also ETHNOLOGY; GAEL; GAUL; IRELAND; PHILOLOGY; SCOTLAND; WALES.

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Celts, *sēlts*, ancient weapons or implements of stone or bronze, found over nearly the whole surface of the earth. The derivation of the word is uncertain, though a very likely origin is to be found in the Welsh *cellt*, meaning "flint." There seems to be no reason whatever to connect the word with the name of the Celtic people. Stone celts are popularly believed in many countries to be thunder-bolts. Hence in different parts of Great Britain they are known as "thunder-axes," "thunder-bolts," etc.; and they are still, or have been known by similar names in France, Germany, Italy, Denmark, Greece, Japan, Burma, and numerous other places. Even the learned did not refuse their countenance to this vulgar error. Connected with this curious belief as to the origin of these stones, there were various superstitions almost equally widespread, such as those regarding their efficacy against lightning and their medicinal virtues. Somewhat similar beliefs were connected with the equally common

CEMBRA NUT — CEMENT

flint arrow-heads. Stone celts are found in the form of hatchets, adzes, or chisels. Some are only about an inch in length, while others approach two feet. The most common length is from six to eight inches, and the breadth is usually about one half or one third of the length. The materials of which they are made are flint, chert, clay-slate, porphyry, various kinds of greenstone and of metamorphic rocks, and, in short, any very hard and durable stone. Some are found merely chipped into shape; others have the edge ground and polished, although the other parts are merely chipped; and there are others which have the whole surface ground and polished. These stone celts belong to the Stone Age of archæologists, the ruder class being regarded as taking their origin in the earlier or Palæolithic Period, the more perfect in the later or Neolithic Period; while the bronze celts belong to the much more recent Bronze Age. Celts that are merely chipped appear to be more common in flint than in any other material. Two good reasons are given for this: first, that most other stones are more easy to grind than flint, and second, that it is more easy to give the proper form to flint than to almost any other stone merely by chipping.

There were two chief methods by which stone celts were attached to their handles. One was to insert the celt tightly in a hole made in the handle. The other was to insert the handle in a hole in the celt. Celts which have such holes to admit the handle are called perforated celts, and many axe- and hammer-heads have been found of this form. Sometimes, instead of a hole being cut right through the handle for the admission of the stone, there was merely a socket made in the wood, in which the celt was firmly fastened by means of some kind of binding. Instead of wooden handles, stags' horns seem often to have been used, and such are sometimes found with sockets at the end, evidently intended for the reception of small celts.

At various places remains have been discovered which indicate pretty clearly that at these spots the manufacture of celts was anciently carried on. Evidences of the existence of such manufactories are to be seen in the neighborhood of the Pfahlbauten of Moosseedorf in Switzerland; at the confluence of the Leochel and the Don in Aberdeenshire; at Cissbury, near Worthing; at Grime's Graves, near Brandon; at Spiennes, near Mons, in Belgium, and many other places. At the last-mentioned place the manufacture was carried on on a very large scale, and the shafts and galleries which were excavated in order to procure the flint necessary for the manufacture are still to be seen. Sometimes, however, the manufacture was carried on at places where the flint or other material out of which the celts were made was not to be had; such, for example, as the one mentioned in Aberdeenshire, and this proves flint to have been among the earliest articles of commerce. The blocks of flint were evidently imported as raw material to those manufactories, and then exported again in the form of manufactured celts. The remains found at these ancient manufactories leave little doubt that the process of manufacture must have been much the same as that by which gun-flints are still manufactured.

Bronze celts belong to a later period than stone ones, and are not so numerous. Some

stone celts, however, have been found along with bronze celts in such a manner as to show that stone celts were still used when the method of working bronze had been discovered, a circumstance that need not be wondered at. Bronze celts are not found so large as the largest stone celts, the largest bronze celt being under 12 inches; but the average size of a bronze celt is about the same as that of a stone.

Stone celts are also found in various parts of the United States, flint and obsidian being largely used in the manufacture of cutting instruments. (See MOUND-BUILDERS.) On the subject of stone celts, consult Evans, 'Ancient Stone Implements of Great Britain.'

Cembra Pine, a fine conifer (*Pinus cembra*) of central Europe and Siberia, having edible seeds and yielding a turpentine called Carpathian balsam. "Swiss stone pine" and "Siberian pine" are variant names. The fruit is known as "cembra nuts."

Cement. A cement is any compound which, under certain conditions, is plastic and under others develops tenacity and can be used for holding together various materials; hence glue, lime, asphaltum, mucilage, and solder are cements. By far the most important class of cements structurally and commercially are the hydraulic cements, compounds of lime, silica, and alumina that have the property when mixed with water to a paste of cohering or setting and finally becoming stone hard, even under water. The hydraulic cements may be divided into four classes based on differences in the materials used. The setting is probably due to the same general chemical reactions in all hydraulic cements; the silicates and aluminates formed in burning take up water and are converted into hydrated calcium silicate and aluminate and crystalline calcium hydrate. The quickness with which these reactions take place vary, the composition of the original materials and the differences in the methods of manufacture being the controlling factors. Quick-setting cements may become hard in a few hours, while some slow-setting cements require many months to reach their maximum tenacity.

The four classes of hydraulic building material above mentioned are: (1) *Hydraulic lime* made from a limestone containing a small proportion of clay (8 to 10 per cent) by burning at a low temperature and slaking the burned rock with water. (2) *Hydraulic or natural-rock cement* made from a limestone containing a relatively high proportion of clay, by burning at a low heat and grinding the product to powder. (3) *Portland cement* made from an artificial mixture of carbonate of lime (either chalk, limestone, or marl), with a certain proportion of clay, burning at a white heat and grinding the clinker to powder. (4) *Pozzuolana or slag cement* made by mixing some kinds of finely-ground scoria (volcanic ash) or blast-furnace slag with a small proportion of slaked lime. Of these the second and particularly the third are of chief importance in this country, though the manufacture of slag cement is a promising industry.

The manufacture of hydraulic lime, though carried on to a considerable extent in France, has never been established in this country, probably owing to the abundance of excellent cement-rock in New York, Pennsylvania, and other

CEMENT

states. Hydraulic lime is light and bulky compared with the other cements. It requires from one to several days to set and hardens slowly, but some grades resist the continued action of sea water even better than Portland cement.

Natural-rock cement.—This material also known as common cement, hydraulic cement, Rosendale cement, and quick-setting cement, is manufactured in great quantities in some parts of the United States. It is made on a considerable scale in France, but the German and English output has been insignificant for some years. In the United States the material used is limestone, often containing over 23 per cent of clay, and the limestone is generally dolomitic, that is, contains carbonate of magnesium. In Europe magnesian limestones are seldom used. The cement rock is quarried, broken, and burnt in continuous kilns, much as limestone in the manufacture of ordinary lime. The burnt rock is a mass of partly vitrified clinker not affected by water. It is ground in mills of several types. Formerly all plants used millstones, and the light yellowish or brownish powder, fine enough to pass a 50-mesh screen, is sent to market in barrels containing about 300 pounds, or in sacks. When mixed with water this cement sets in a few minutes and hardens gradually. It is cheap and when mixed with one part of sand by weight is used for mortar or concrete and for cistern and reservoir linings. It has not the great tensile strength of Portland cement, hardens slower and more imperfectly.

The composition of Rosendale cement rock and natural hydraulic cement is as follows:

Carbonate of lime.....	45.91
Carbonate of magnesia.....	26.14
Silica and insoluble.....	15.37
Sesquioxide of iron.....	} 11.38
Alumina.....	
Water and undetermined.....	1.20
	100.00
Silica.....	22.75
Alumina and iron sesquioxide.....	16.70
Lime.....	37.60
Magnesia.....	16.65
Alkalies.....	.....
Carbonic acid.....	5.00
Sulphate of lime.....	} 1.30
Water.....	
Total.....	100.00

The chief center of the industry in this country is the Rosendale district of Ulster County, New York, where the rock quarried is a limestone of the lower Helderberg series. It is also made in Pennsylvania, the Louisville region of Kentucky and Indiana, at several points in Illinois and around Milwaukee, Wis. The natural or Rosendale cement industry has weakened since 1903, and the production in 1906 was only one-twelfth that of the manufactured article.

Portland cement.—This material was first made in England in 1824. The name is taken from the resemblance of the mortar to the oolitic limestone of Portland island in the English channel. The industry was later taken up in Germany. In both countries the industry grew enormously and the output now amounts to over 20,000,000 barrels yearly in Germany, and about half as much in England. Portland cement was first made in the United States at Coplay, Pa., in 1878, and since then works

have been established in nearly every one of the United States. The growth of the industry is perhaps the most marvellous thing in the whole history of the industrial development of this country. No farther back than 1894 the total annual product was small. Since then the output has increased enormously, over 100 per cent in a single year, and the annual product now exceeds the combined output of England and Germany.

The composition of some Portland cement materials and Portland cements is shown by the following tables:

	Coplay, Pa., natural rock and limestone		Monte- zuma, N.Y., clay and marl		Santa Cruz, Cal., clay and coral rock		Phillipsburg, N.Y., natural rock only
	Ce- ment rock	Lime- stone	Clay	Marl	Clay	Coral- lime		Ce- ment rock
Lime.....	37.60	50.15	6.62	47.68	2.83	51.31	42.00
Silica.....	18.34	4.46	50.08	6.22	63.73	2.40	16.00
Alumina...	4.08	1.00	14.50	1.70	22.12	1.56	6.00
Iron ses- quioxide.	3.41	.48	4.61	.86	9.01	.51	2.00
Magnesia..	1.39	.87	4.40	.04	.....	1.25	.38
Alkalies....	.19	trace	5.10	2.20	.21	1.45	.....
Carbonic acid.....	31.05	40.40	.....	42.11	.....	40.32	33.42
Sulphuric acid.....	.....	.....	.....	.....	.....	.....	.....
Sulphur....	.73	.15	.....	.....	.....	.....	.....
Water.....	.....	.....	.....	.....	1.12	1.21	.....
Organic and unde- termined.	3.21	2.49	14.69	.....	.98	.99	.20
Totals..	100.00	100.00	100.00	100.81	100.00	100.00	100.00

	Coplay, Pa.	Santa Cruz, Cal.	Phillipsburg, N. Y.	High grade English	Alsen & Son, Germany
Silica.....	20.64	23.48	22.00	25.00	24.90
Alumina.....	6.93	8.47	9.00	12.00	} 11.22
Iron sesquioxide.....	5.41	5.18	4.00	60.00	
Lime.....	62.79	61.91	62.00	1.00	59.98
Magnesia.....	1.72	.....	1.00	.....	.38
Sulphuric acid.....	.11	.....	.....	.....	.86
Alkalies.....	.27	.92	.....	1.00	.50
Water.....	.....	.....	.....	.....	.....
Carbonic acid.....	.99	.....	.50	.....	.....
Loss and undetermined	1.14	.04	1.50	1.09	2.16
Totals.....	100.00	100.00	100.00	100.00	100.00

In 1891 but 13.2 per cent of the product used in this country was of domestic manufacture; in 1906, notwithstanding the great increase in consumption, due to the growth of the building industry from 1895 to 1906, the domestic manufacturer furnished 93 per cent of the material used. To-day the best grades of American Portland cement are as good as those produced anywhere, and in effectiveness of equipment, large output, and cheapness of production, the leading Portland cement plants of this country are models for the world. Not even in the development of our iron and steel industry have American energy, resourcefulness and mechanical skill been better displayed. In making Portland cement, two processes are used, the wet and the dry. In the wet process marls and clays are used; in the dry process natural cement rock. The wet process plants

CEMENTATION PROCESS — CENCI

are mostly in the marl section of Ohio, Indiana, and Michigan; the dry plants in the limestone and shale regions of Indiana, Missouri, Virginia, eastern Pennsylvania, and western New Jersey. It is in the Lehigh section of Pennsylvania that the best features of American practice have developed. The stone is quarried by the use of air-drills and high explosives, at a cost of 18 to 50 cents per ton; the shale and limestone broken in large gyratory crushers, thoroughly dried in mechanical drier, finely ground in ball or tube mills or in mills of the centrifugal type and burnt to a clinker in cylindrical rotary kilns. The clinker is cooled in cooling towers and ground or stored for a few days, and then ground to a fine powder in ball, tube, or centrifugal mills. For burning the clinker coal dust is generally used as fuel. The finely-ground clinker is packed in barrels holding 400 pounds each, or in sacks, for market. In the wet process the methods used differ only up to the burning of the clinker, and the differences are due to the nature of the materials, the clay and marl being ground together wet. But 15 per cent of the United States product is made in the wet way. In 1906 the production had extended to nearly every State in the Union, Pennsylvania and New Jersey being in the lead.

The following table shows the production of natural hydraulic and Portland cement; the imports, exports, and domestic consumption; figures taken from 'The Mineral Industry.'

YEAR	Production			Imports	Exports	Consumption	
	Natural hydraulic	Portland and slag cement	Total barrels			Barrels	Value
1885..	4,000,000	150,000	4,150,000	\$840,191	\$113,555	.....	.....
1890..	7,664,500	335,500	8,000,000	3,175,159	152,295	.....	.....
1900..	8,383,519	8,928,629	17,312,148	3,330,445	289,186	19,677,143	\$16,617,825
1902..	8,044,305	17,709,199	25,753,504	2,582,281	575,268	27,486,496	27,373,343
1903..	7,030,271	22,868,833	29,899,140	3,027,111	466,140	32,026,925	34,492,312
1904..	4,866,331	26,808,926	31,675,257	1,382,913	1,104,086	31,959,978	26,256,392
1905..	4,473,049	35,629,259	40,102,308	1,102,041	1,387,706	40,725,388	35,685,741
1906..	3,935,151	47,092,046	51,027,321	2,950,268	944,886	52,844,022	56,122,095

Slag cement.—The ancient Romans used volcanic scoria or "pozzuolana" mixed with slaked lime to make a cement, the durability of which

is attested by the solid masonry of many ruins. Within recent years it has been found that certain kinds of furnace slag, especially those from the manufacture of steel by the basic process, can give hydraulic properties to common lime. The mixture forms a slow-setting and slow-hardening cement that in time develops great strength. The production in the United States continues small, though the product is gaining ground abroad, and the tonnage produced in Germany is considerable. In this country the industry did not exist until 1895. Now there are large works making slag cement at Chicago, Ill.; near Birmingham, Ala.; at Jersey City, N. J., and elsewhere. A plant at Sharon, Pa., uses slag having the following composition: Silica, 32.72 per cent; alumina, 12.95 per cent; iron, 2.52 per cent; lime, 47.67 per cent; magnesia 2.71 per cent; sulphur, 1.44 per cent. This slag as it comes from the furnace is granulated by contact with water and then dried. The lime is burnt, slaked, and mixed with the slag by mechanical mixers. The mixture is finely ground in tube mills. The resulting cement has this composition: Silica, 27.33 per cent; alumina, 11.61 per cent; iron, 2.43 per cent; lime, 55.83 per cent; magnesia, 1.93 per cent; sulphur, .87 per cent. The total production of slag cement in the United States in 1906 was 481,224 short tons, valued at \$412,921. There are at least seven plants making it, two being in Alabama.

See CONCRETE CONSTRUCTION; GLUE; LIMESTONE; MORTAR; PORTLAND CEMENT.

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Cementation Process, in steel making. See IRON AND STEEL; STEEL; STEEL MANUFACTURE.

Cemetery, a place of sepulture. See BURYING PLACES.

Cenchrus. See SAND-BURR.

Cenci, Beatrice, bā-ä-trē'chē chēn'chē, Italian lady, the cause of the extermination of the noble family of Cenci. Muratori, in his 'Annals' (Vol. X., part I, 136), relates the story as follows: Francesco Cenci, a noble and wealthy Roman, after his second marriage behaved toward the children of his first marriage in the most shocking manner, procured the assassination of two of his sons, on their return from Spain, by banditti, seduced and debauched his youngest daughter Beatrice, a maiden of singular beauty. She discovered this shocking crime to her relatives, and even sought to obtain protection from Pope Clement VIII. It appears, however, that this was not granted: for, when the guilty father continued his former treatment with aggravated wickedness, she joined with her brother Giacomo, and hired two assassins, who put the monster to death as he slept. The guilty parties were discovered, confessed the murder on the rack, and were condemned by the Pope

CENEDA — CENOZOIC ERA

to be torn to pieces by horses. In vain did the learned Farinaceus exert himself to obtain a mitigation of their punishment by a lively representation of the depravity of the deceased, 9 Sept. 1598.' According to other accounts, Beatrice and her relatives appear to have had little or no share in the murder of the old Cenci; but a tissue of villany and baseness gained belief to the false testimony of two banditti against the Cenci family. So much is certain, that, 11 Sept. 1599, Beatrice Cenci and her stepmother were executed with a sort of guillotine called mannaia. Giacomo was killed with a club; the younger brother was pardoned on account of his youth; but the estates of the family, to which belonged the Villa Borghese, were confiscated, and in 1605 presented by the reigning Pope, Paul V., of the house of Borghese, to his family. In the Barberini Palace at Rome, travelers are shown an excellent painting, said to be by Guido Reni, as the portrait of the unfortunate parricide; but this is now controverted, and recent investigations tend to show that the popular version of the whole story is far from the true one. Shelley has made the Cenci the subject of a drama. See Bertolotti, 'Francesco Cenci e la sua Famiglia' (1877).

Ceneda, chā-nā'dä. See VITTORIO.

Cenis, sě-ně', **Mont**, a mountain belonging to the Graian Alps, between Savoy and Piedmont, 11,755 feet high. It is famous for the winding road constructed by Napoleon I., which leads over it from France to Italy, and for an immense railway tunnel, which required nearly 14 years' labor. It superseded a grip railway which was constructed over the mountain by Mr. Fell, an English engineer in 1864-8. The tunnel does not actually pass through the mountain, but through the Col de Fréjus, about 15 miles to the southwest. The Mount Cenis Pass is 6,765 feet above the level of the sea, whereas the elevation of the entrance to the tunnel on the side of Savoy is only 3,801 feet, and that on the side of Piedmont 4,246 feet. The total length of the tunnel is 42,145 feet, or nearly 8 miles. For the sake of the drainage the bottom of the tunnel has a culminating point about the middle, and falls southward 128 feet, and northward 473 feet. The breadth of the tunnel at the base is about 25 feet, at the widest part about 26 feet; its height at the Modane end is 24 feet 7 inches; at the other end about a foot higher. The determination of the exact direction and height of the tunnel occupied a full year, and the work of piercing the tunnel was carried out with so much precision that the borers who had begun simultaneously from both ends met exactly. The tunnel is laid out for two lines of railway. The roof and walls are lined with masonry to the thickness of two feet seven inches, and where the ground is not very firm it is underarched. The boring was at first carried on by hand labor, and one eighth of the total length of the tunnel was finished in this way, but the rest was constructed by machines specially devised for the purpose. Each boring machine had 18 borers, by which holes about three feet in depth were wrought in the rock. For the blasting of every yard of the tunnel 97 borings on an average had to be made, and above 100 pounds of gunpowder were employed. The total cost of the tunnel amounted to \$12,636,000, which was borne partly by the

French and Italian governments and partly by the Northern Railway Company of Italy. The first mine of the tunnel on the Italian side was exploded by Victor Emmanuel at the end of August 1857; on Christmas Day, 1870, the workmen met in the middle of the tunnel; and on 17 Sept. 1871, the tunnel was officially opened.

Cen'obites (Gr. κοινος, common, βίος life), monks living in community with others, under a common rule instead of seeking the strict solitude of anchorites. The ascetics of the first ages, who dwelt in the deserts together, were usually called by this name, the place in which they lived being called a *cænobium*. Some writers refer the institution of these communities to the times of the apostles, others to St. Anthony (q.v.).

Ce'nogen'esis. While many animals during postembryonic growth pass through a series of stages which are similar to the ancestral forms of such types (palingenesis), in certain species development is direct. The different stages of growth or metamorphosis are crowded back to the embryo stage, or abbreviated, and the animals hatch or are born in the shape of their parents. This is called cenogenesis. Thus certain frogs, as a tree-toad of Guadeloupe, W. I., where there are no marshes, do not pass through a tadpole stage, but hatch without tails, and with legs, and otherwise resemble their parents. The same is the case with certain shrimps and crabs, and is partly the case with the lobster. In all such instances the direct development is apparently due to a difference in the environment, or other conditions of life, especially in certain crustacea, to a change from salt to fresh water.

Cenotaph, sěn'ō-tăf, a monument erected in honor of a deceased person, but not containing his body, as is implied from the derivation (Gr. κενός empty, and τάφος a tomb). They were often erected by the ancients, who believed that when the body was not buried the soul could not be admitted into the abodes of the blessed.

Cenozoic (sē-nō-zō'ik) **Era**, the last of the five great divisions commonly used in classifying geological time, and therefore including the present. As it is the last, its records are much more complete than those of the Mesozoic, but while more complete they are, perhaps, more perplexing. Of the older eras — as, for instance, the Palæozoic — much of the record left in the rocks has been obliterated, and thus only the traces of the greater changes in the distribution of land or water and of variations of climate have come down to us. Thus, while much is lost, the broader grouping of facts is easier. In the Cenozoic we have such a wealth of detail, such a great mass of evidence to sift and correlate, that geologists differ greatly as to how the record of the rocks shall be translated.

Generally speaking, the rocks of the Cenozoic Era are less compacted than those of the Mesozoic, being very often beds of loose sand or clay. They usually lie horizontal, though sometimes upturned in a great mountain range. Any particular series is seldom of wide extent, and different series tell widely different stories of climatic conditions. Thus, probably no series in the Cenozoic in North America is comparable with the coal-bearing formations of the Cretaceous.

CENSER — CENSORSHIP OF THE PRESS

As to the climate of the Cenozoic, it was at first remarkably mild and even, Spitzbergen and Greenland having as mild a climate as that of Ohio to-day. Gradually the climate became colder, resulting in the great continental glacier of the Ice Age. At a comparatively very recent date these glaciers receded, and the climate of the earth became substantially what it is to-day.

Cenozoic life is, on the whole, well differentiated from Mesozoic, particularly by the great development of mammals and, probably well along in its last half (reckoning by actual time), by the advent of man. As mammals have developed, so reptiles have declined, and to-day only snakes, crocodiles, lizards, and turtles represent the class; the great ichthyosaurs, plesiosaurs, dinosaurs, and pterosaurs were passing away by the end of the Cretaceous. In fact, as the Mesozoic was the era of reptiles, so is the Cenozoic the era of mammals. Among invertebrates many curious Mesozoic types have disappeared, but of the genera in existence early in the Cenozoic most still exist. This also is true of Cenozoic plant life.

As has been noted, geologists differ in their divisions and subdivisions of Cenozoic time. American geologists generally make two great divisions, Tertiary and Quaternary.

Consult: Dana, 'Manual of Geology'; Geikie, 'Text-book of Geology'; Le Conte, 'Elements of Geology.' See also GEOLOGY; GLACIAL PERIOD; TERTIARY.

Cen'ser, a vessel in which incense is burned. Censers were employed by the Jewish priests for presenting incense to the Lord in the sanctuary. Josephus tells us that King Solomon made 20,000 gold censers for the temple of Jerusalem to offer perfumes in, and 50,000 others to carry fire in. Censers or thuribles are used in some modern churches, especially in the Roman Catholic Church at mass, vespers, and on other occasions. They are suspended by chains, by which they are swung about in the hand to spread the incense in all directions.

Censors, *sen'sorz*. In ancient Rome, originally two magistrates whose chief duty it was to keep the register of property, on which all political rights were based; the community being graded by amount of income from estates. Being thus arbiters of the political and social position of every freeman, they speedily became the most important officials in the state except the occasional dictators. The supreme judicial functions, and the control of morals, fashion, and speech, which we associate with "censorship," flowed naturally from this. The essence of their duty being to fix the status of each citizen, they took cognizance of everything which bore upon it; and became arbiters of the sumptuary laws and customary observances which are the cement of early communities. Not only could they expel a senator from the senate and take his horse from a knight or even reduce him to the ranks for lack of property qualification, or notorious evil living, but they could punish for slack tillage, celibacy, demeaning occupations, extravagance, or any other conduct thought prejudicial to the common weal. There was an appeal to the popular assembly, however, and they had to state their charges publicly. The censors also filled vacancies in the senate, and appointed its

chief, originally at will, later according to a prescribed list. They let out the taxes to farm, took charge of public buildings, roads, aqueducts, etc. The term, legendarily five years at the outset, was a year and a half in historical times; originally patricians alone were eligible, but by fully historical times the plebeians had gained one censorship and occasionally secured both. The emperors assumed censorial power under the title "prefects of morals." The last who bore it was the brother of Constantine the Great.

In American history, the title was given to two sets of state officers in imitation of the Roman office. The 1776 Constitution of Pennsylvania provided that the people should elect a council of censors once in seven years, two for each city and county, to investigate the acts of the governmental departments, inquire whether or not the Constitution had been violated, etc. This curious article was dropped in the revised Constitution of 1790. But in Vermont a similar article had a far longer life, surviving until a comparatively recent time. That State in 1777 proclaimed its independence, and drew up a Constitution. One article, following the example of Pennsylvania, provided that on the last Wednesday of March in 1785, and the same day every seventh year thereafter, the people should choose a council of 13 censors, who should examine whether the Constitution had been preserved inviolate; whether the legislature had performed its duty as a guardian of the people, or had exceeded its powers; whether the taxes had been justly laid and collected, and how the public moneys had been expended; and whether the laws had been duly executed. They were also empowered, if they thought a change in the Constitution was needed, to call a convention to meet within two years thereafter, giving notice of the proposed change at least six months before the meeting. The last one so called, in 1870, abolished its creator; but the censorship seems to have worked fairly well for nearly a century.

Censorship of the Press, a regulation subjecting books, pamphlets, and newspapers to the examination of certain civil or ecclesiastical officers, who are empowered to authorize or forbid their publication. Such a regulation was suggested by Plato, and an informal censorship existed in the times of Greece and Rome. After the Roman Catholic Church acquired a share in the civil power it induced the state to condemn heretical books. Throughout the Middle Ages it sanctioned the principle that books objected to by its authorities should be suppressed. The invention of printing and the increasing number of books called forth new and stricter prescriptions of censorship, and there still remain copies of books printed in 1479 and 1480 which are accompanied with solemn approbations and attestations in their favor. Finally, in 1515, the Council of the Lateran, assembled at Rome, decreed that in future no books should be printed in any town or diocese unless they were previously inspected and carefully examined by the bishop of the diocese or his deputy, or by the inquisitor of the diocese or his deputy, or if at Rome by the Pope's vicar and the master of the sacred palace. Every work which was approved was to be countersigned by the hand of the censor, and any publication not thus coun-

CENSURE — CENSUS

tersigned was to be burned and its author or editor excommunicated. See INDEX.

In countries where the Reformation prevailed, the censorship was not abolished. Licensers of books were appointed in England, who were for the most part bishops. A general system of censorship was established by a decree of the Star Chamber, dated 11 July 1637, which was later confirmed by an act of Parliament. It was against this act that Milton wrote his great plea for freedom of the press, the 'Areopagitica,' but the censorship was not abolished until 1693.

Censorship of the press existed under the old French monarchy. It was abolished at the Revolution, but revived under Napoleon I. and again under Napoleon III. Except in Russia and Germany, where it is still in force, systematic censorship of the press may be said scarcely longer to be maintained in European Christian countries. In the United States there has never been such a censorship, although there are laws against publications of a scandalous character; there are various State laws against libel and a government censorship in the Philippines.

Censure, in canon law, a spiritual penalty whereby a contumacious offender is denied the use of certain spiritual goods. It has three degrees, excommunication, suspension, and interdict. By excommunication the offender is cut off from association with the faithful whether in spiritual things or in secular; by suspension a minister of the Church, a cleric, is deprived of the right to exercise the functions of his station; by interdict the services and ministrations of the Church are denied to an offender—the sacraments and the right to Christian burial. An interdict may affect places as well as persons; it may be laid on a church edifice or a burial place. Censures are the penalties prescribed in the Church's law for definite offenses, and some censures fall upon the offender, *ipso facto* or *ex ipso jure*, without need of a judgment being pronounced by Church authorities. Such a censure is said to be *latæ sententiæ*, that is, providing for its own carrying out; but most censures are *ferendæ sententiæ*, requiring that the sentence be pronounced by some proper authority, as the bishop of a diocese or his deputy. And absolution from some censures *latæ sententiæ* is reserved to the supreme pontiff, while absolution of other censures can be given by bishops, or other pastors, either in the ordinary course of their jurisdiction or in virtue of special faculties accorded to them to that end. An example of a censure, release from which is reserved strictly to the supreme pontiff himself, is the censure of excommunication incurred by whoever violently assaults a cleric or a member of a religious order (*clericus vel monachus*); but an exception is made of the case where the offender is in danger of death.

Cen'sure, Congressional, of the President of the United States, a makeshift in lieu of an unattainable impeachment. There have been two cases of this, one by the Senate and one by the House. (1) During the long debate in the winter of 1833-4 over Jackson's cessation of deposits in the United States Bank, resolutions of censure were moved in the Senate; and after three months' wrangling over them and their form, it resolved 28 March 1834, 26 to 20, that

the President had arrogated authority "not conferred by the Constitution and laws, but in derogation of both." Jackson, by a special message 15 April, protested that this was a virtual impeachment of him as violating his oath of office, without giving him a chance to defend himself. The Senate majority (John Tyler being one) refused to receive or record the protest. Thomas H. Benton thereupon gave notice that he should move yearly to have the resolution expunged. It was objected that this contravened the Constitutional requirement to keep a journal, but Benton argued that the resolution was no part of legitimate legislative proceedings. On 16 Jan. 1837, the Jacksonians carried the curious compromise of having the resolution surrounded with black lines on the journal, and marked "Expunged by order of the Senate"; which of course left it intact, and merely recorded a change of feeling as to its justice. (2) To catch the Southern vote, the Democrat Tyler had been put on the ticket of the Whig Harrison in 1840; and on Harrison's death within a month of inauguration succeeded him as President. The Congress was Whig; and at its first session 1841-2, passed a tariff bill to distribute the surplus revenue among the States. Tyler vetoed it on the ground that the country had no business to raise taxes in excess of its needs, and that it was simply legalizing unjust burdens on the people. The Whigs had not a two-thirds majority to pass the bill over his veto, could not carry an impeachment, and in the House referred the veto message to a committee, which in its majority report censured Tyler for improper use of the veto. Tyler protested, and in reply the House sent him a copy of the Senate resolution he had voted for in Jackson's case.

Census. The utility to a government of knowing the extent of its resources in men and property is so obvious that some means of ascertaining it were probably employed early in history; but there is no record of it on the Egyptian or Assyrian inscriptions, and the Chinese accounts are dubious. The first we have reliable mention of is that of the Jews by David, including the males of 20 and over and the cattle; and the hatred and suspicion aroused by it are witnessed by the belief that God punished the whole people for the impiety. This apparently irrational feeling was universal in early times, has always been so in the East, and is by no means unknown elsewhere and later; its prevalence in 18th-century America, and even later in England, however, is probably due to misunderstood Bible teaching. The real reason was, that the early censuses had for an object not statistics, but taxation and conscription; and it was not to the advantage either of officials or people that the government should have too minute a knowledge of what could be extorted from them. Poverty and sparseness of population were too convenient excuses for not paying taxes or not remitting them to the capital. In the West, however, when constitutional government replaced autocracy, the census became a necessity for apportioning political rights and contributions; as in the Solonian constitution of Attica, where society was divided into four classes, with privileges graded according to income from landed estates. In Rome, whence the name "census" ("assessment") comes, it

CENSUS

was much the same; and as the enumerations were valued merely for the ratings deduced from them, not from any idea that statistics by themselves were of any value, they were discarded as soon as their use had passed, to the irremediable impoverishment of history. These censuses were taken at long and irregular periods, sometimes nearly half a century elapsing. But as the empire grew and the provinces were farmed by proconsuls, these found the same need of a thorough detail of their temporary estates, to know whether their sub-farmers were cheating them, that a capitalist does of his business; and each took a census (*professio*) of his own province on his own account, whose inquiries were sometimes almost as minute and exhaustive as those of the latest United States special census report on agriculture.

The mediæval censuses were of the roughest and far apart, and made only by a few enlightened rulers. Charlemagne attempted one for his dominion; and the Domesday Book of William the Conqueror in 1181 is familiar. This was a register of estates, with the heads responsible for feudal duties, their slaves and cattle—a census of the primitive type for the primitive objects.

The modern census, as a statistical review for its own sake, has a treble origin, in Sweden, England, and the United States. In 1686 the Swedish parish clergy were required to keep a record of births, marriages, and deaths, accessions and removals of inhabitants, unusual happenings, etc. Of course registration, which is a record of changes, is not a census, which is a statement of condition at a certain time; but with a given basis it can be turned into one. By request of the Swedish Academy of Sciences, in 1746, the clergy were directed to compile statistics of population, etc., for a quarter-century past; but these were kept rigidly confidential till 1762. At their publication Dr. Richard Price, the founder of scientific life-insurance calculation, based his first insurance tables on them. At first annual, then triennial, since 1775 they have been published once in five years. Meantime, in England, the London bills of mortality, first begun after the plague of 1592, had been recorded weekly since 1603, the year of James I.'s accession; and in the last half of the 17th century Sir Wm. Petty, the noted political economist, used them as a basis for very valuable and stimulating works on the extent and growth of population, human fecundity, effects of social and political causes, etc. Others took up the subject and made computations. In 1791 Sir John Sinclair undertook the most herculean statistical task ever attempted, perhaps, by a single man—to compile a census of the population, agriculture, trade, and industry of the entire kingdom, by inquiries sent to the clergy of the Established Church. He sent out schedules of 160 interrogatories, received over 900 replies, and in 1798 published 21 volumes of results. His work, and his exhortations made weighty by his work, induced Parliament in 1800 to establish a census office; the first census was taken the next spring, and decennial censuses have been maintained ever since. That of 1851, like the American of 1850, was a long step in advance. The Russian censuses had begun earlier, but on the most ancient model, purely for military purposes, and therefore with no count of females. There were

a few partial censuses from 1700 on. In 1718 Peter the Great ordered all landed proprietors to give in an account of their slaves; and the same year organized a body of canvassers to visit all the provinces and make returns to him of peasants, mechanics, domestics, and people without occupation. In 1722 a ukase ordered a census taken every 20 years thereafter, and it was observed till 1782, another taking place in 1796. In 1802 a central bureau was organized, and a census taken; and they have been taken in 1812, 1815, and 1834, decennially 1850-80, then in 1886 and 1897. France began taking them after the Revolution, Prussia in 1805; Austria, which had made rough counts for military conscription, organized a bureau in 1828; Belgium established one immediately after winning her independence in 1833, and it has been perfected by the genius of Quetelet and other eminent statisticians, and furnished most valuable contributions to science. Our own census was entirely independent of all these in origin.

The United States Census.—For the various guesses at colonial population, and the methods of arriving at them, see UNITED STATES (*Population*). It may be mentioned here, as germane to this subject, that when Gov. Hunter of New York in 1712 attempted to take a census, the biblical prejudice before mentioned compelled him to leave it unfinished; and that when the New Jersey government a few years later wished to do so, it did not dare begin. An accurate determination, however, became vital early in the independent life of the country. To apportion equally the burdens of the Revolutionary war, the Congress of the Confederation agreed to defray the charges out of a common treasury, to be supplied by the States in proportion to the value of all the land in each; and to requisition the quotas of land forces according to the quotas of white inhabitants. Under the Constitution of 1787 the question of number became exigent, as direct taxes and representatives in Congress were apportioned according to the number of free inhabitants in each State (including bound servants and excluding Indians not taxed) and three fifths of all others. Censuses, therefore, became part of the ordinary running machinery of the government; and the first one was taken in 1790. Nine months were allowed for the work, but the time was extended the next year, as regularly for many a decade thereafter. The scope of inquiries simply included families: the name of the head alone being set down, with the number of others included, and slaves as a property item, the sex and color of free persons, the number of free white males of 16 and upward, number of free white females, and of all other free persons. The enumeration was committed to the marshals of the judicial districts of the United States (16 in all), who were to employ assistants as needed. No form of schedule was provided, each enumerator using any sheets or blank book he chose. This continued till 1830. There was no central bureau to receive or supervise returns, which were put together by the marshals and transmitted to the President. A penalty of \$200 was imposed for false returns or delay beyond a certain time; and the same on individuals for giving false information or refusing any. The returns in the North were given by counties, cities, and towns; in the South by counties only. Two copies of the enumeration of each

CENSUS

district were to be posted in some public place therein. The cost of this census was \$44,377.28. The result, as usual, pricked many local bubbles; and as the country was not used to this, there was not only general disappointment but distrust of the census, and United States officials carefully explained to foreigners that the returns were very defective. This is not now believed.

The second census, that of 1800, was specifically intrusted to the Department of State. There was no change in methods, except that the secretary was to instruct the marshals as to schedules and interrogatories. The only changes in scope were to classify the ages of free white males rather more minutely, extend the classification to females, and insert the name of county, city, or town where the family resided. Memorials by Thomas Jefferson and Timothy Dwight, under the names of learned societies, wisely suggesting that Congress utilize the occasion by having the census include statistics of mortality, nativity, and industries, were ignored; but took root in later censuses. There were 19 districts, and the cost was \$66,109.04.

The third census, that of 1810, improved somewhat on the loose methods of the two former. The enumerators now had to be residents of their districts, which could not be more than one county or city, but might be several contiguous towns, and must be plainly marked off by natural or political boundaries; and they must make personal inquiries at each dwelling-house or of the head of each family in their district. In Territories the secretary, or if there was none, the governor, replaced the marshal. Attested copies of the returns must be filed with the secretary of state. An attempt at a manufacturing census was made, and the secretary of the treasury was empowered to give instructions for it. But the time was too short; the inquiries were too many and injudiciously framed; the manufactories in a district were generally so few that the returns would disclose their private business, and there was no penalty for refusal to answer; and the returns were scattering and valueless for volume, though they had some value as indicating variety and distribution of industries. There were 26 districts and Territories, and the cost was \$178,444.

The fourth census, that of 1820, for the first time introduced the valuable feature (suggested by Jefferson and Dwight) of distinguishing between natives and foreigners, naturalized or otherwise. It also discriminated the free colored and the slaves by sex and age, and the free whites between 16 and 18. It reduced the manufacturing interrogatories to 14, of much the same scope as now, and a digest was ordered made and printed. This department was a failure as before, however. There were 31 districts, and the total cost was \$208,525.99.

The time of taking the fifth census, that of 1830, was changed on John Quincy Adams' suggestion to 1 June, as it has ever since remained. A very significant provision in the act was to prevent the marshals from blackmailing their subordinates, by exacting either bribes in advance or part of their pay later. Printed schedules were sent out, of uniform size, 18 x 15. The industrial statistics were dropped altogether. But inclusion was made of the deaf and dumb—white, free colored, and slave—classified by age but not by sex, and of the blind, not classi-

fied at all. Ages were also very minutely classified. There were 36 districts and Territories, and the cost was \$378,545.13.

The sixth census, that of 1840, was in one respect the beginning of a new era; in most others, the close of an old one. It first attempted health statistics—those of the insane and idiotic, at public and private charge; educational—scholars in colleges, academies, and public schools, illiterates over 20, etc.; besides Revolutionary pensioners, an item wholly aside. Industrial statistics were also restored, and much matter collected. In a word, it was the first systematic and connected attempt to make the census a general body of usable statistics in the larger sense, a comparative survey of the life and changes of the country. But the effort is all that can be praised; its execution was a national scandal. The errors were so teeming and so monstrous that various bodies sent protests to Congress against its publication, and urged that it be either corrected, or if that were not possible, entirely disowned. This result was due partly to inadequate pay and ignorant enumerators, but partly also to the dislike in many sections to the new questions as "inquisitorial" and offensive. The old dislike to governmental "prying" was strong enough to warrant a prominent paper in becoming its spokesman, insinuating that the census was a "precursor to direct taxes," and that it was unworthy of "the dignity and the high functions of the Federal government to pursue such petty investigations." There were 39 districts, and the cost of the census was \$833,370.95. It was published in three volumes.

All these six censuses had a common defect which robbed them of ultimate statistical value: they lacked uniformity in method, and to a large extent could not furnish comparisons or accurate deductions. The enumeration extended over long periods, many months at a time; the results were not summarized by counties, nor uniformly by cities or towns; the classification of ages of colored people was on a different basis from that of whites, etc.

The seventh census, that of 1850, begins a new era. The blunders of the last one, and the public disgust and indignation, had aroused great discussion as to proper methods; and on 3 March 1849, the same act which created the Department of the Interior also created a census board, consisting of the secretary of state, the attorney-general, and the postmaster-general, to prepare a census schedule including not above 100 inquiries. They framed plans which were adopted by Congress 23 May 1850. These schedules comprised: (1) Free inhabitants. (2) Slaves. (3) Mortality. (4) Products of agriculture. (5) Manufactures. (6) Social statistics. But the great advance which it made was in scheduling individuals instead of families, thereby making full statistical comparison for the first time possible. The name, age, sex, color, and place of birth of each person, free or slave, were now set down. Improvements in method were also made. The enumerators' districts were to be not exceeding 20,000, if feasible, on the basis of the last census; the returns were not to be compiled by the marshals, but at a central office in Washington created within the Department of the Interior. Its head or "super-vising clerk," commonly called "superintendent

CENSUS

of the census," was Joseph C. G. Kennedy of Pennsylvania; the latter part of the compilation was done under the charge of James D. B. De Bow of Louisiana. There were 45 districts, and the work cost \$1,423,350.75.

The eighth census, that of 1860, was on much the same lines as the previous one. Mr. Kennedy was superintendent. Fortunately, the enumeration was finished before the War broke out. The principal change in schedules was to classify females as well as males by occupation. In the compilation, slaveholders and slaves were classified by States and Territories for 1850 and 1860. There were 64 marshals and secretaries. Cost, \$1,969,376.99.

The ninth census, that of 1870, was taken under changed conditions, some of which interfered with its completeness and accuracy. The mass of enfranchised negroes in the South could no longer be counted on plantations by one authority, and were too ignorant to answer questions for themselves; and the Reconstruction conditions greatly impeded work. A new system had been carefully drawn up by Garfield, after consultation with Francis A. Walker, Edward Jarvis, and other eminent statisticians, which would have made partial amends; but it was killed in the Senate. It formed, however, the basis of the next census. Gen. Walker, then chief of the bureau of statistics in the Treasury Department, was made superintendent, and his ability did much to redeem the defective system. The heading "slaves" had of course to be dropped, and the number of male citizens of the United States to be substituted. To satisfy the 15th Amendment, a schedule was introduced of the number of such citizens whose right to vote was denied or abridged except for crime, etc.; but it was valueless. The month of births and marriages within the year was added. In "colored," Chinese and Indians were discriminated from negroes. In "illiterates," those unable to read were distinguished from those unable to write. In nativities, the place of parents' birth was added, for the first time giving the number of native citizens of foreign parentage. A statement of public debts, State, municipal, etc., was included. Many changes were also made for clearness, or to remove objectionable inquiries. The enumerators were put under civil-service reform rules.

A strong effort was made to have an inter-decennial census taken in 1875, but it was not successful, though Grant recommended it in two annual messages. But for that of 1880, the system desired for 1870 was passed, under Garfield's presidency, completely revolutionizing the census methods. The changes may be summarized as follows: (1) The superintendent of the census and his chief enumerators, instead of being mere clerks of the secretary of the interior, became officials directly appointed by the President and confirmed by the Senate. (2) The marshals—court officers appointed for duties unconnected with census work and often conflicting with it—were replaced by supervisors of the census, not to exceed 150 in all, and each State or Territory to have at least one. The entire number were appointed, and New York State had 11. Their assistant enumerators were subject to veto by the census office. (3) The enumerators' districts were reduced to an estimated maximum of 4,000 instead of 20,000,

these subdivisions being also subject to the disallowance of the census office. This increased the number of enumerators from about 6,400 in 1870 to 31,265 in 1880; and enabled not only a swifter completion of work, but much closer local and personal knowledge on the part of enumerators, as each must be a resident of his district. (4) The time of enumeration was reduced to one month, or two weeks in cities of over 10,000 inhabitants by the previous census; making results more nearly simultaneous. (5) Compensation was more closely adjusted to work. (6) Industrial statistics for 279 cities and large towns, and for the country at large in certain selected industries, were withdrawn from the regular enumerators and given to certain special agents, who need not be residents. The enormous advantage of this scarcely needs exposition. Not only did it allow the employment of abler experts, but manufacturers will often give information to distant strangers, to be filed far off, which they would not put in the hands of local residents. In this census also a large use was made of "prior schedules," left with parties before the enumerator called; they had been introduced in 1870, but little employed. This census was by far the best, speediest, and most helpful of all to that date, and marked another era. The scope was also extended. For the first time the statistics of defectives, crime, and pauperism were thoroughly and properly classified; those of the factory system, of churches, museums, taxation, insurance, etc., entirely new, with better ones of schools and colleges, collected independently, were of great utility; and many improvements were made in other schedules. Gen. Walker was the head of this census also, and the author of most of its advances. Its cost was \$5,790,678.40.

The 11th census, that of 1890, was in general taken by the same methods as the 10th. Ten chiefs of division were appointed, 175 supervisors, and 47,975 enumerators. The superintendent was Robert P. Porter. The most important additions were: (1) All surviving soldiers, sailors, and mariners of the Civil War, and their widows. (2) Classification of colored persons according to amount of white blood, from full-blooded negroes up to octo-rooms. (3) Indebtedness of private corporations and individuals. (4) All Indians in tribes, with Indian and English names of each, age, occupation, and whether paying taxes or not. (5) Census of Alaska. (6) Unincorporated express companies. An attempt was made to collect statistics of chronic disease; but the inquiries were too delicate to intrust to local residents or expect people to communicate to such, and the statistics gathered were of no value, besides exciting much public ill-will. Special agents were employed for 1,042 manufacturing centres, in place of the 279 in 1880. Special attention was paid to nativity, to fecundity of native and foreign-born mothers, the expectation of life of children of native and foreign-born parents, naturalization, and ability to read and speak English. Prior schedules were extensively used. Electric tabulation was employed, not alone greatly increasing both speed and accuracy, but enabling various statistical compilations to be made which were otherwise impracticable. It filled 25 volumes, and cost \$11,547,127.13.

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For the 12th census, that of 1900, preparations had been mooted before the 10th was well under way; and the question of a permanent census bureau, strongly urged over half a century since by the able statistician De Bow, was brought up, and its merits set forth in a valuable and exhaustive report by Supt. Porter. After much debate, an act of 3 March 1899 established such an office in the Department of the Interior. By this act the superintendent of the census is entitled the director of the census. The President, who appoints him, must also appoint an assistant director, who must be an expert statistician; and the director is to appoint five known and tried statisticians as chiefs of divisions, a geographer, a chief clerk, and a disbursing clerk. The first director under this bill was William R. Merriam; assistant director, Frederick H. Wines; chiefs of divisions, William C. Hunt, population; William A. King, vital statistics; S. N. D. North, manufactures; Le Grand Powers, agriculture; Walter F. Wilcox, methods and results; geographer, Henry Gannett. The law creating this bureau, however, greatly limited its scope. The collection of "side" statistics was thought to retard the preparation and publication of those assumed to be alone of general interest, and the inquiries were restricted to the four heads of population, mortality, agriculture, and manufactures. The work was to be finished within two years; and at this writing (May 1903) three of the heads have been published, two volumes for population, two for agriculture, and four for manufactures. This limitation would not be regrettable—the census organization not being the ideal one for many classes of statistical inquiries—but that Congress is not likely to appoint other boards or commissions to do the work thus dropped, as is done in foreign countries. There the census relates only to population, and other inquiries are made through other sources, or by copying registration returns. Congress, however, is doubtful of its power to compel answers except through the census acts.

State Censuses.—A number of States have Constitutional requirements that a State census shall be taken once in 5 or in 10 years, or between two national censuses; but only a few pay any attention to the matter or attain results of any value. Massachusetts, Rhode Island, New York, and Michigan thus far are the only States which have done good work in this line. The Massachusetts censuses from 1855 on, and the Michigan of 1874 and 1884, are notably good. On 3 March 1879, an act of Congress provided that any State which will take an interdecennial census in all respects equal to that of the United States, and file a copy with the secretary of the interior, shall receive from the national government 50 per cent of the amount paid to supervisors and enumerators, plus 50 per cent of the gain per cent in population between the two last preceding national censuses. Even this lure, however, has not thus far increased the interest of the States in their statistics.

WILLIAM R. MERRIAM,
Supt. Twelfth Census.

Cent, a United States coin and money of account, the 1-100 of a dollar. The convenience of decimal computation has caused in various countries the division of the monetary unit into

hundredths, with names derived from Latin *centum* or its adjectives; as the French franc into centimes, the Dutch guilder into cents, the Italian lira into centesimos, the Spanish-American dollar into centavos, etc. Jefferson regularly used "cent" to mean the hundredth of any unit of mensuration; but in its first suggestion for our coinage it meant 100. The inconvenience of the English system being felt, Congress in 1781 instructed Robert Morris to devise a system of national coinage; and he proposed a unit of $\frac{1}{4}$ grain silver (or $\frac{1}{1440}$ of a Spanish dollar, familiar in the colonies), of which 100 were to make a cent (about 7c. of ours), 500 a quint (34.7c.), and 10,000 a mark (\$6.94). Jefferson proposed instead the dollar as the unit, the smallest coin to be of copper and $\frac{1}{200}$ of it (that is, the old English farthing, our half cent); this was adopted 6 July 1785. But on 8 Aug. 1786, an act was passed, still modeled by Jefferson, to coin a cent, of which 100 were to weigh $2\frac{1}{4}$ pounds avoirdupois (157.5 grains each), and be equal to a dollar, and a half-cent proportionate. This was the first use of the name in our coinage, and doubtless represents Jefferson's "hundredth." The "cents" prior to this have not that name on them, and are really English half-pence. The difficulty of displacing a popular name is shown by that of "penny," which still clings tenaciously though absurdly to our cent, only half its value. Congress in 1787 established a mint in New Haven, and for years coined there the "Fugio" or "Franklin" cents, familiar to collectors. But from 1785 to 1788 several States coined copper "cents" on their own account. Vermont (not yet admitted) began in June 1785; Connecticut in October 1785; Massachusetts late in 1786 (real cents and half-cents); New York, 1786; New Jersey, 1786 (coppers 15 to the shilling). Under the Constitution the first coinage act was passed 2 April 1792, and raised the weight of the cent to 264 grains; but on 14 Jan. 1793, it was reduced to 208, and on 26 Jan. 1796, to 168, the half-cent always being proportional. The first coinage under the new act was in 1793. This old-fashioned "copper" remained unchanged except in pattern till 1857, and its forms from 1793 to 1857 are of seven types: (1) 1793, chain or link around the word "cent"; (2) 1793, wreath in place of chain; (3) 1793-6, liberty cap on pike over left shoulder of "Liberty"; (4) 1796-1807, "Liberty" with draped bust; (5) 1808-14, filleted head with 13 stars; (6) 1816-39, plain coronet with coiled hair; (7) 1839-57, same with braided hair. No cents were coined in 1815 or 1835. Those of 1799, 1793, and 1804, are very rare, as are also the *copper cent* of 1856, and the half-cents of 1793, 1831, 1840 to 1848, and 1852. On 3 March 1851, a 3-cent piece was authorized, of $12\frac{3}{8}$ grains, 75 per cent silver, 25 copper, legal tender to 30 cents; on 3 March 1853, it was raised to .900 fine, but reduced to 11.52 grains, $\frac{3}{50}$ of the half-dollar. On 21 Feb. 1857, the half-cent was abolished, and the old cent replaced by a smaller new one, of 72 grains, .88 copper and .12 nickel. On 22 April 1864, this was supplanted by a bronze cent, 48 grains (the present one), .95 copper and .05 tin and zinc, legal tender to 10 cents; and a bronze 2-cent piece, twice its weight and legal tender. On 3 March 1865, a 3-cent piece was authorized, $\frac{3}{4}$ copper and $\frac{1}{4}$ nickel, 30 grains, legal tender

CENT — CENTAURY

to 60 cents; but the ones and twos were made legal tender to only four cents. On 16 May 1866, a 5-cent piece (the "nickel") was authorized, same material as the 3, 77.16 grains, legal tender to \$1. On 12 Feb. 1873, all cents and their multiples were discarded except the 1, 3, and 5, as above, each to be legal tender to 25 cents; and on 26 Sept. 1890, the 3-cent piece was discarded. See NUMISMATICS.

Cent, a name given under the old Germanic constitution to a small portion of territory. Each province or district was subdivided into so many cents, and was placed under the special jurisdiction of an overseer or centenarius. The name corresponds with hundred as in English territorial division.

Cent-Gardes, sän-gärd, **Les** (Fr., "The Hundred Guardsmen"), a body-guard acting in the service of the French king during several centuries. See GUARDS.

Cent Jours, sän zhoor, **Les** (Fr., "The Hundred Days"), the second period of the reign of Napoleon I., so called because it lasted precisely 100 days, from 20 March 1815, when he re-entered Paris on his return from Elba, to 28 June of the same year, when the second restoration was established.

Cent Nouvelles Nouvelles, sän noo-vël noo-vël, a collection of facetious tales, first published at Paris in 1486. They were told at the table of the dauphin, afterward Louis XI., in the castle of Genappe during his exile. Their arrangement in their present form has been attributed to the Count of Croi, to Louis himself, and to Antoine de La Salle. The latter, however, seems to have been the editor. The work is a curious example of a kind of literature distinctively French, and which, since its revival by Voltaire in the last century, has always been successfully cultivated: the literature that considers elegant mockery and perfection of form adequate compensation for lack of morality and lofty ideals. The historical importance of the collection arises from its giving details regarding the manners and customs of the 15th century that can be found nowhere else. Its very licentiousness is commentary enough on the private life of the men and women of the time. In spite of its title, however, there is nothing novel in the incidents upon which the 'Nouvelles' are based. Their novelty consists in their high-bred brightness and vivacity, their delicately shaded and refined but cruel sarcasm. With a slight modernization of the language they might have been told at one of the regent's suppers, and they are far superior to those related in the Heptameron of the Queen of Navarre. The 'Nouvelles' also show us that the Middle Ages are past. Instead of gallant knights performing impossible feats to win a smile from romantic châtelaines, we have a crowd of princes and peasants, nobles and tradesmen; all, with their wives and mistresses, jostling and duping one another on a footing of perfect equality. Another sign that a new era has come is the mixed social condition of the 32 story-tellers; for among them, obscure and untitled men, probably domestics of the Duke of Burgundy, figure side by side with some of the greatest names in French history.

Centaurea, sën-tô'rë-a (commonly called BACHELOR'S-BUTTON, CORN-FLOWER, DUSTY-MILLER, or KNAPWEED), a genus of annual or perennial herbs of the natural order *Compositæ*. There are about 400 much confused species, mostly natives of western Asia and the Mediterranean region. A few are found in the western hemisphere, but only one, *C. americana*, in the United States. This species, popularly called basket-flower, is a very attractive hardy annual with rose-colored flowers. Many of the species are widely used in ornamental gardening. The following are among the most popular garden sorts: *C. cyranus*, the blue-bottle or corn-flower, common in European grain fields and frequently found wild in America. Its blue flowers yield a blue dye. *C. cineraria*, the dusty-miller, has white hairy leaves, and when grown as an edging plant—its most popular use—it is not allowed to flower. *C. moschata*, sweet-sultan, is widely grown for its large, fragrant flower-heads. *C. montana*, mountain bluet, which originally had blue flowers, has developed various other tints under cultivation. All the species are easily grown from seed and thrive in any good garden soil.

Centaur, sën'tôrz, in Greek mythology, a fabulous race of people dwelling in Thessaly, on Mount Pelion. According to fable they sprang from the union of Ixion and a cloud. They are said to have been half horse and half man, and the fable is explained in this manner: The Centaurs first practised the art of mounting and managing horses. In the time of the Thessalian king Ixion a herd of wild bulls on Mount Pelion committed great devastations in the adjacent country. Ixion offered a reward to whoever should destroy them, in consequence of which the Centaurs trained horses for riding and slew the bulls. Mythology relates the combats of the Centaurs with Hercules, Theseus, and Pirithous. The latter, at the head of the Lapithæ, another Thessalian nation, their hereditary enemies, entirely defeated the Centaurs, killed many, and drove them from Pelion. The Centaurs, Nessus, Chiron, and others are famous in fable. See CHIRON; DEJANIRA; HERCULES.

Centaurus, sën'tô-rüs, or **The Centaur**, a southern constellation, only a small part of which rises in our latitude. Two stars of the first magnitude are catalogued in the portion which does not appear above our horizon. This is one of the 48 ancient constellations formed by Ptolemy, who first discovered the likeness of a centaur in it. On the celestial maps of the Arabs it is represented by a bear mounted on horseback.

Centaur, a genus of plants (*Erythraea*) of the natural order *Gentianaceæ*, of about 30 widely distributed species, mostly natives from western Asia to western Europe, of which two are of distinct ornamental merit. One of these (*E. venusta*) is from California; the other (*E. massoni*) from the Azores. They are hardy little annuals with rose-colored flowers, and are frequently planted in rockeries, in the soil of which the seeds may be sown in early spring. Some of the related species have been used to a small extent in domestic medicine, but rarely in regular medical practice. American centaur (*Sabbatia angularis*), of the same natural order,



Photograph by J. Horace McFarland Co.

CENTAUREA

CENTAVO — CENTERVILLE

is widely distributed in rich soil and sunny situations from western Canada to the Gulf States. It is often cultivated for its cymes of fragrant showy white or rose-colored flowers. Like the above, it has been used to a small extent in domestic medicine for simple ailments.

Centavo, thĕn-tă'vō, a Chilean coin equivalent to the cent (q.v.).

Cen'tenary, the commemoration of any event, as the birth of a great man, or the founding of a city or institution, which occurred 100 years before.

Centennial Exhibition, a World's Fair held in Philadelphia, Pa., from 10 May 1876, to 10 November of the same year. To celebrate the 100th anniversary of American independence, an association of Philadelphians in 1870 proposed an international exhibition of arts, manufactures, and agricultural products, to be held in the city where independence was declared. Congress passed an act 3 March 1871, authorizing the exhibition and also appointed a commission of one member and an alternate from each State and Territory, nominated by the governors, to report on dates of opening and closing, plans for buildings, method of receiving and classifying articles, custom-house regulations. The commission was organized 4 March 1872, with Joseph R. Hawley of Connecticut as president; and on 12 May chose as director-general of the exhibition Alfred T. Goshorn. On 1 June Congress appointed a centennial board of finance, to raise funds for the exhibition. This board was to solicit subscription to \$10,000,000 of stock, and the corporators and subscribers were to elect 25 directors, who should apply the funds on the plans of the commission. Of 227,940 of individual subscriptions, Pennsylvania gave \$1,749,468. The city of Philadelphia added \$1,500,000; the State of Pennsylvania \$1,000,000 more. Then Congress appropriated \$1,500,000, besides \$500,000 for a government building. Fairmount Park was selected as the site, 236 acres being used for the purposes of the exhibition. The buildings of the exhibition proper consisted of the main building (for manufactured products, mines and metallurgy, the public works of all nations, and a conspectus of science and education), built of iron and glass with masonry foundations, 70 feet high, 1,880 x 464 feet, with central transept of 416 feet and two end transepts of 216; Machinery Hall, 1,402 x 360, of wood and glass on masonry foundations, occupying with an annex nearly 13 acres; Agricultural Hall, 820 x 540, of wood and glass; Horticultural Hall, built by the city of Philadelphia, a permanent structure of iron and glass in Moorish 12th-century style; Memorial Hall, intended as a permanent art gallery, of granite, glass, and iron, in Renaissance style, 365 x 210 and 59 feet high, with a central tower 150 feet high, surmounted by a colossal statue; the United States Government Building, 504 x 306; the Women's Pavilion, an acre in extent, not only for the convenience of women, but for the collection and exhibition of their work; the Shoe and Leather Building, and the Carriage Building, besides annexes. Moreover, 26 States erected buildings of their own, costing over \$400,000; and a number of foreign countries, out of 49 which took part in the proceedings by invitation, erected their own buildings. There were over 200 separate buildings in

all. The admission fee was 50 cents; 7,250,620 paid it in full, 753,654 paid a special 25-cent rate, and 1,906,692 went in free, making 9,910,966 admissions in all.

By the system of awards adopted the exhibits—to the number of over 50,000—were divided into 36 groups, and these subdivided again and again into small sections. Each of the last was assigned to a special jury of awards, who had to make a statement in writing of the special merits they found in the articles which they esteemed best, and the uses for which each was best fitted, and to sign their names to the award: this left no room for carelessness or irresponsibility, and gave the maker the benefit of names of known weight. These judges included many of the ablest and most famous men of science and the professions and other great experts in the Western World; and the awards have been a source of just pride.

The exhibition was a most important landmark in the industrial history of the country, and other countries. Not only did it make later ones possible and successful here, but it diffused inventions, broke down stolid self-conceit, and immeasurably advanced the knowledge of all the nations which took part in it. For instance, the Bell telephone was first exhibited there, and gained immediate celebrity from Sir William Thomson's enthusiastic praise; and the American bicycle manufacture sprang from Col. Pope's inspection of English cycles there. It showed European countries with new clearness the marvels of American machinery-making, especially the immense development of mechanism with interchangeable parts, from watches to steam boilers and artillery. It made the first collection ever attempted of women's work on a large scale. It first made the beauty and grace of Japanese decoration and patterns popularly known. It shed new light on art principles in general. It illuminated educational systems with light from foreign sources. No public or private money was ever better invested than that devoted to creating and profiting by this collection. The official account of the exhibition was published by the government in 1880.

Centen'rial State, a popular name given to the State of Colorado on account of its admission to the Union in 1876, the 100th year of American independence.

Centeno, Diego, dĕ-ă'gō thān-tă'nō, Spanish soldier: b. Ciudad-Real, Spain, 1504; d. La Plata, upper Peru, 1549. Going to South America he accompanied Alvarado to Peru and soon became famous as a skilful fighter.

Center. See CENTRE.

Centerville, Iowa, city in Appanoose County; on the Rock Island, the C. B. & Q., the I. & St. L. and the Iowa Central R.R.'s, 70 miles south of Des Moines. The town was settled in 1832 and was incorporated as a city in 1846. It is the centre of a coal mining, agricultural and stock-raising region. It has four banks, 15 churches, and an excellent public school system. Pop. (1900) 5,256.

Cen'terville, Va., a village of Fairfax County, 27 miles west of Washington. It is memorable for the series of battles fought in its vicinity on the last days of August 1862, in which the Federal army, under Gen. Pope, suffered heavy loss and a severe repulse.

CENTESIMO — CENTO

Centesimo, sĕn-tĕs'ĩ-mō, a coin of Italy, Peru, etc., equivalent to a centime (q.v.).

Centiare, sĕn'tĩ-ār, or sōn-tyär, a measure of surface of the metric system, the hundredth part of an are (q.v.) or one square metre, equivalent to 10.764 square feet.

Centigrade Scale. See THERMOMETER.

Cen'tigram, or **Cen'tigramme**, a weight of the metric system, the hundredth part of a gram (q.v.), equivalent to 0.15432 grain troy.

Centiliter, or **Centilitre**, sĕn'tĩ-lĕ-tĕr, a measure of capacity of the metric system, the hundredth part of a litre (q.v.), equivalent to a little more than three fifths of a cubic inch.

Centime, sän-tĕm, a French coin, in value one hundredth of a franc or about one fifth of a United States cent.

Cen'timeter, or **Cen'timetre**, a measure of length of the metric system, the hundredth part of a metre (q.v.), equivalent to 0.3937 inch. Its abbreviation is *cm*.

Centimeter-Gramme-Second System. See UNITS.

Cen'tipede, or **Centiped**, one of those myriapods (*Chilopoda*) with long, many-jointed, flattened bodies, each segment bearing only a single pair of legs. The mouth-parts, besides a pair of jaws (mandibles), consist of two pairs of maxillæ, those of each pair being fused together in the middle. The first pair of legs are fused at their base, and form the poison-fangs, the poison-gland being situated in the base, and the poison oozing out of an orifice at the end of the leg. The single oviduct and corresponding male duct open at the end of the body in the penultimate segment. The centipedes (*Scolopendra*) are mostly confined to the tropics, a small species extending as far north as North Carolina. Those of the West Indies and the tropics in general are eight to nine inches in length, one species, however, attaining the length of 18 inches. Their bite is dangerous, quite as much so as the sting of the scorpion. They are ferocious when attacked or seized, biting energetically. In the northern States the centipedes are represented by the species of *Lithobius* (*L. americanus*), which are wrongly called "earwigs," and live under stones, under the bark of fallen trees, etc. They prey on insects and worms. They have been observed to attack earthworms, grappling with them for several hours and, after killing them, sucking their blood. Very long, slender forms are *Geophilus* and its allies. The body is composed of from 30 to nearly 200 segments, each bearing a pair of legs. They are eyeless, and live buried in the sand, coming to the surface under stones.

The centipedes are hatched with numerous segments, and corresponding legs. Wood states that the female of a centipede (*Scolopocryptops sexspinosa*) guards her young by lying on her side, and then coiling her body, passes them along by a quick action of her feet, thus arranging them satisfactorily to herself. He also describes the manner of molting in this species.

The chilopods are more nearly related to the insects than are the millipedes (q.v.). They are a less ancient group. No true *Chilopoda* are known to exist in rocks older than the middle Tertiary period, species of *Cermatia*, *Scolopendra*, *Lithobius*, and *Geophilus*, having been de-

tected in amber and the gypsum beds of Aix, Provence, France, of Oligocene age. (See CHILOPODA.) Consult: Wood, 'The Myriapoda of North America' ('Transactions,' Amer. Phil. Soc., Philadelphia 1865); also the writings of Meinert.

Centlivre, sänt-lĕvr, **Susanna Freeman**, English actress and dramatist: b. Ireland about 1667; d. London 1 Dec. 1723. When very young she married a nephew of Sir Stephen Fox. Becoming a widow within a year she took for a second husband an officer of the army of the name of Carrol, who was killed in a duel the second year of their wedlock. This event in her singular career reduced her to considerable distress, and led her to attempt dramatic composition. Her first production was a tragedy entitled the 'Perjured Husband,' performed in 1700. This was followed by several comedies, chiefly translations from the French, which exhibited the vivacity that distinguishes her literary character, and met with some temporary success. She also tried the stage as an actress on the provincial boards, and by that means attracted the attention of her third and last husband, Mr. Centlivre, Queen Ann's head cook, whom she married in 1706. She still continued writing for the stage, and produced several more comedies. Some of these remain stock pieces, of which number are 'The Busy Body'; 'The Wonder'; and 'A Bold Stroke for a Wife.' They are diverting from the variety of incident and the liveliness of the characters, but want the accompaniments of adequate language and forcible delineation. They partook of the license of the age. Mrs. Centlivre enjoyed the friendship of Steele, Farquhar, Rowe, and other wits of the day. Having, however, offended Pope, she obtained a place in the Dunciad, but is introduced by no means characteristically. An edition of her works with a biography appended appeared in 1872.

Cent'ner, a German weight, in common use on the continent of Europe, which is nearly the equivalent of the British hundredweight. It formerly varied in the different German states, but since the introduction of the metric system of weights and measures into the German empire, 1 Jan. 1872, the value of the centner has been fixed at 50 kilograms, or 100 German pounds, equivalent to 110.23 pounds avoirdupois. In Austria it is equal to 110½ pounds, and in Sweden to 112.06 pounds.

Cento, chĕn'tō, Italy, a city 13 miles north of Bologna, on the eastern bank of the canal of Cento, and near the river Reno. It is surrounded by a rampart and ditch, and contains several churches, convents, and a cathedral. The celebrated painter, G. F. Barbieri, commonly called Guercino, was born here about 1590. Pop. 5,000.

Cento, sĕn'tō (Latin, "patchwork"), originally a cloak made of patches; hence, as Lessing observes, the dress of Harlequin is called in Apuleius *mimi centuculus*. The term has been transferred to such poems as have been formed out of verses taken from other poems. It was a particular art to combine passages of different authors on different subjects in this manner so as to form a regular whole. Thus there were in early times Vergilian centos (*centones vergiliani*), in which most of the verses

CENTRAL AFRICA PROTECTORATE — CENTRAL AMERICA

were taken from Virgil; for instance, the 'Cento Nuptialis' of Ausonius, and centos from the verses of Homer (*Homero-centones*).

Central Africa Protectorate. See BRITISH CENTRAL AFRICA PROTECTORATE.

Central America is a continent of distinct geologic formation, with east and west mountain-folds, at right angles to those of North and South America. Though on the map it appears to be a mere isthmus extending in a southeasterly direction from Mexico to Colombia, between the Caribbean Sea and the Pacific Ocean, it is in fact structurally much more nearly related to the West Indies, including the Gulf of Mexico and the Caribbean Sea, and to the northern coast of South America, than to the main bodies of the larger continents. Probably in the Tertiary period Central America and the Antilles together formed a great island or archipelago lying between North and South America. (Compare Robert T. Hill's 'Cuba and Porto Rico,' etc.). This subject will be referred to below, in connection with "volcanoes and soil."

Politically, the name groups together Guatemala, Honduras, Salvador, Nicaragua, and Costa Rica: five republics which are characterized in the treaty of peace signed at Corinto, Nicaragua, 20 Jan. 1902, as "the Central American family." Moreover, the Isthmus of Panamá at the commencement of its history under the Spanish régime was associated not less intimately with the settlements in the region north and west of it than with those of South America; British Honduras (Belize) also, an English colony, lying between Guatemala and the Caribbean Sea, has been connected about equally with the history of the Central American states and with that of Yucatan (Mexico). We shall therefore mention both Panamá, a department of Colombia, and British Honduras in the following historical sketch.

History.—Rodrigo de Bastidas, a notary of Triana, was the first Spaniard to explore the Caribbean coast of Central America. He embarked at Cádiz in October 1500; and, after reaching the mainland of South America near the present Venezuelan boundary, coasted westward and made observations of the isthmus from a point below Darien to Nombre de Dios. Columbus, on his fourth voyage to America, sailing from Cádiz 9 May 1502, and stopping at Santo Domingo on the way, arrived off the shore of Honduras July 30. There he heard reports of the wealth of Mexico, but decided to continue the voyage southward, searching for a strait that should lead across terra firma to India. Thus they passed a cape to which they gave the name Gracias á Dios, and on 25 September reached the river San Juan de Nicaragua, and heard stories from the natives which made them believe they were within a nine-days' journey of a splendid land, such as Marco Polo had described in his veracious account of travels in Asia, and that the river Ganges lay only a little beyond. On 7 October they came to the beautiful Laguna de Chiriqui, and on the adjoining Veragua coast they obtained a large amount of gold by trading with the natives.

Columbus lingered in the immediate neighborhood of the Chagre (now called Chagres) River and Colon—at Porto Bello from 2 to 9 November, and at other points within a few

miles for three weeks and five days. Thus during more than a month the great discoverer hovered voluntarily about the spot where the strait he dreamed of was to be cut after four centuries should have elapsed. And when he thought to return by the way he had come, abandoning the search, stress of weather held his vessels back, so that it was not until 6 Jan. 1503, that they anchored in a little river just west of Colon. He wished to plant a colony on the coast between Veragua and Cerebaro, but, hostilities breaking out between the Spaniards and the natives, the former were obliged to abandon their attempt, and once more Columbus passed the place of the future canal, clinging to the shore before setting a straight course for Jamaica.

First Spanish Colonies.—In 1506 Juan Diaz de Solis and Vicente Pinzon sailed along the coast of Honduras westward, exploring the Gulf of Honduras, in search of a passage by water to the Far East—India and Cathay. Several years passed before the Spanish king, Ferdinand, authorized Alonzo de Ojeda and Diego de Nicuesa to colonize and govern in his name the northern coast of South and Central America. The river Darien or Atrato was made the dividing line between their dominions. The eastern or South American portion was called Nueva Andalucia, and of this Ojeda was made governor; the western division was named "Golden Castile," *Castilla del Oro*, and the command given to Nicuesa. The latter secured the larger number of followers; the former, however, attracted to his standard Martin de Enciso, afterward governor, Balboa, discoverer of the Southern Sea, and Francisco Pizarro, conqueror of Peru. The forces of both governors suffered extreme hardships. Nicuesa's capital was at Nombre de Dios, Ojeda's at San Sebastian—so named because the Indians afflicted them as that saint was tortured. Ojeda returning to Española, where he died, Enciso, Balboa and Pizarro removed the capital of Nueva Andalucia to Antigua del Darien—that is, a point within Nicuesa's dominions; but the natives of Darien did not poison their arrows. In the contest for supremacy that ensued, Nicuesa was the loser. Balboa assumed command, and Antigua became the centre of Spanish enterprise in that part of America. On 25 Sept. 1513, Balboa discovered the Southern Sea, and four days later took possession of it, with all its lands and ports and islands in the name of the king and queen of Spain. Before news of this discovery reached the Spanish court, a successor to Balboa had been appointed in the person of Pedrarias (also called Dávila). In 1517 Balboa was falsely charged with treason, and executed. Pedrarias Dávila, being superseded in command, migrated to the south coast and founded the city of Panamá, 15 Aug. 1519.

A voyage into the unknown northwest from Panamá was made in 1522 by Gil Gonzales, who explored the Dulce and Nicoya gulfs indenting Costa Rica's southern shore. Thence northward 50 leagues he went, to the domain of a chief whose name was Nicaragua, and who dwelt near the principal lake of that region. Gonzales learned that this lake, though lying near the Southern Sea, had an outlet to the Caribbean. In his narrative he says that the discovery is important, inasmuch as only "two or three leagues of very level road separate the two

CENTRAL AMERICA

seas." The expedition returned to Panamá in 1523, after baptizing thousands of natives and securing 112,000 *pesos* of gold. On 15 Sept. 1521, Panamá was made a city with royal privileges; the episcopal see was transferred to it; from this base expeditions were sent out toward Peru as well as into the northwest. Pedrarias, in 1524, dispatched Francisco Hernandez de Cordova with Hernando de Soto and other captains to Lake Nicaragua. Gil Gonzales, continuing his discoveries in Honduras and Nicaragua, came into collision with de Soto; and only a little later one of the captains of Hernan Cortez, the Spanish conqueror of Mexico, appeared as a claimant for the territory of Honduras.

In the latter part of October 1524 Cortez set out from Mexico, marching to Honduras with an army of about 100 horsemen, 40 archers and arquebusiers, and 3,000 native warriors and servants. After making himself governor of the country, he returned in triumph to Mexico City in May 1526. Pedrarias went to Nicaragua about the same time: there were rival Spanish governors even then in Nicaragua and Honduras. Guatemala and Salvador were overrun by Pedro de Alvarado, second in command to Cortez: the former country, in which a great empire had existed at the beginning of the Christian era, was inspected by Alvarado in 1522, and conquered with a small force of Spaniards and native allies before two years had passed.

Veragua.—In 1535 an unsuccessful attempt to colonize Veragua was made in the interest of the descendants of Columbus (on whom the titles, "Duke of Veragua," etc., had been conferred), and a still more calamitous enterprise was that of Diego Gutierrez, a citizen of Madrid who led an expedition to Costa Rica north of Veragua in 1540. Francis Drake, English privateersman, attacked Nombre de Dios in 1572. Again, in 1595, Drake (now Sir Francis, knighted for his feat of sailing round the world), Sir John Hawkins and others took Nombre de Dios; but an English force of 750 men sent to attack Panamá was defeated by the Spaniards when half-way across the isthmus. Drake, dying on 28 Jan. 1596, was buried off Porto Bello. The conquest of Costa Rica was undertaken by Nicaraguan Spaniards in 1560. Partial success rewarded the efforts of the soldiers; meanwhile, however, great progress had been made in the pacification of that province by the efforts of Franciscan friars.

Buccaneers in the 17th Century.—Captain William Parker, sailing from Plymouth in November 1601, captured Porto Bello. In December 1616 the king of Spain informed the governor of Castilla del Oro that he and the commercial world believed that communication might be easily established between the oceans by constructing a canal. This was the century of English depredations and of Spanish idle dreaming—Spain's centuries of vigorous expansion having passed. In 1668 the Welsh buccaneer Morgan plundered Porto Bello, his foul cruelty rivaling any Spanish misdeed in this blood-stained region. Three years later, having at his disposal a fleet of 37 ships and a force of 2,000 fighting men, he captured Panamá (January 1671). The inhabitants set fire to their homes, and built a new city of the same name at a little distance in a locality less exposed to

attack. Granada, in Nicaragua, was sacked by French and English pirates in 1686.

Scotch Colony on the Isthmus.—A number of influential Scotchmen, chief of whom was the founder of the Bank of England, William Paterson, were authorized by the Scottish parliament in 1695 to found colonies in savage lands; afterward obtaining letters patent from William III. of England. Paterson chose Darien, believing the control of the traffic of the isthmus to be essential to the prosperity of England; he certainly was not, as is incorrectly and commonly stated, merely anxious to make money for his company, and reckless of consequences to the colonists. See Bannister's 'Life'; Rodriguez's 'Anexion de Cuba'; etc. The largest and most costly expedition that had yet been fitted out for colonization in America sailed from Leith, 26 July 1698, and founded "New St. Andrew." Subsequently recruits were sent out to them; but the project came to a miserable end. More than 2,000 lives and several millions of money had been lost, when the survivors were starved into surrender by the Spaniards.

A British squadron commanded by Admiral Edward Vernon (21 Nov. 1739), took Porto Bello, but was defeated at Cartagena. Meanwhile English settlements of a very peculiar character had been begun in Mosquitia and at Belize.

Mosquito Coast.—The Misskito tribe, called by the Spanish and English "Sambos" or "Mosquitos," a hybrid people, descendants of fugitive slaves, "Cimarrones," and natives, ruled by an hereditary king, dwelt on the eastern coast of Honduras and Nicaragua in the 17th century. Unoccupied by the Spanish, this coast was frequented by buccaneers, who made Cape Gracias á Dios, on the dividing line between the colonies just mentioned, their rendezvous. Small settlements of English adventurers existed in this region; by the treaty of Madrid (1670) certain rights were conceded to Great Britain; the British claim was asserted (1744) by sending troops and building forts, but withdrawn (1786) when an agreement was reached as to the cession by Spain of the territory on the north coast of the Gulf of Honduras to which we shall now refer.

The English Colony.—The foundation of Belize, on the coast east of Guatemala and south of Yucatan, by the Scotch buccaneer Peter Wallace, has been described in the article "Belize." The ex-freebooters of Belize, reinforced by other white adventurers, Mosquito Indians, etc., were able to exploit the rich forests and hold their own, or more, in the contest for the possession of this territory waged at intervals between the authorities of Yucatan and the wood-cutters (regarded as interlopers) from 1733 until the end of the 18th century. The treaty of Versailles (1783) defined the limits of Belize; such limits were more precisely stated in the treaty signed at London, 14 July 1786; but the boundaries were subsequently extended by encroachments of the wood-cutters. Thus England, retaining the region now known as the colony of British Honduras, abandoned possession of the Mosquito coast, though her claim to exercise a certain degree of influence in the latter territory (from which the Spaniards were expelled by the Sambos in 1796) was not expressly and absolutely surrendered until 1850 or 1860. (See treaties mentioned below.) Before that deter-

CENTRAL AMERICA



Importance of places is indicated by different lettering, thus:
25,000 or over.....GUATEMALA
10,000 to 25,000.....Santa Fe
1,000 to 10,000.....Limon
Smaller Places.....San Rosa
Steamship Routes.....
Railroads.....
Submarine Telegraph Cables.....



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84° Longitude West from Greenwich 86°

CENTRAL AMERICA

mination, several reverses were sustained in Nicaragua. An English force was repulsed at Fort San Carlos in 1769. A few years later the design to sunder the Spanish provinces of Central America, and at the same time to capture a route for an interoceanic canal, by taking possession of Lake Nicaragua and the cities of Granada and Leon (see Bancroft's 'Central America'), proved infeasible. An English force of about 1,800 men, including a party of marines under Horatio Nelson, was forced by the deadly fevers to abandon the attempt.

Spain in Possession.—Except Belize, Mosquitia, and large tracts in which the Indians remained nearly undisturbed, Spain now held the land, but no longer had energy or opportunity to develop its natural resources. The natives, more docile and serviceable than in other parts of America, seldom increased the difficulties of the situation by uprisings; there was, however, little incentive to accumulate property in a land menaced constantly for a hundred years by English, Dutch, and French pirates, and the mother country had grown too poor to take the lead in industrial enterprises. The several divisions of an apathetic population were easily drawn together for administrative purposes: the captain-general of Guatemala by the middle of the 18th century controlled the provinces of Costa Rica, Honduras, Nicaragua, and Salvador, beside others now within Mexican boundaries. Revolt against Spain was the form in which the spirit of the people awakened from this lethargy, naturally expressed itself. Unfortunately armed revolt has ever since been too closely identified with progress in the popular conception. The first weak blow for Central American freedom was struck in San Salvador, 5 Nov. 1811. A sequel to this attempt (in Leon, Nicaragua, 13 Dec. 1811) duplicated this Salvadoran effort, in result as in motive. A third failure was recorded when the Colombian insurgents (1820) fitted out a combined sea and land expedition to operate against the towns of Omoa and Trujillo. The Isthmus of Panama cast in its lot with South America, rather than with Central America, by voluntary annexation to the republic of Colombia on 28 Nov. 1821. (For its subsequent history see COLOMBIA and PANAMA.) The declaration of independence at the city of Guatemala, 15 Sept. 1821, was little more than an echo of the triumphant cry of other Spanish-American colonies in revolt; it was soon followed (5 Jan. 1822), by a decree of the *junta directiva* annexing Central America to Mexico. Salvador refusing to join in this surrender, a war with Guatemala ensued. Before 18 months had passed the Central American provinces resolved to form a union and constitute a single nation. On 1 July 1823 a national constituent assembly expressed this purpose, the name chosen for the nation being *Provincias Unidas del Centro de America*.

Slavery Abolished.—Though laggards in the race to win freedom, the Central Americans were prompt in bestowing it. The laws of 31 Dec. 1823, and 17 and 24 April 1824, emancipated their slaves and declared that slaves of other countries on coming to Central America should be freed. When dissensions and civil war broke up their confederacy, they had at least taken one step forward, in advance of their neighbors. The congressional decree of 30 May 1838, granting to the states the privilege of unrestrained

action in most important matters practically dissolved the union, though Salvador tried to maintain or renew it long after the other confederates withdrew. Nicaragua, on recovering her autonomy, became involved in a dispute with Great Britain, the latter upholding the claim of the Mosquito king to all the territory lying between Cape Gracias á Dios and the mouth of the San Juan River, and sending (January 1848) two warships to occupy the port of San Juan. Nicaragua yielded provisionally to superior force. At this point the intervention of the United States was felt. The Clayton-Bulwer treaty, concluded at Washington 19 April 1850, between the United States and Great Britain, provided that neither power should occupy, fortify, colonize, or exercise dominion over any portion of Central American territory (except Belize), or make use of a protectorate in any form. In regard to this treaty the statements have been made: (1) That it guarantees Central American independence; (2) That it encourages the maintenance of English influence. Both statements are correct. The English influence was considered beneficial within certain limits (see BELIZE.) By the Zeledon Wyke treaty of 28 Jan. 1860, England ceded to Nicaragua absolutely the protectorate over the Mosquito coast.

Walker's Campaign.—While the diplomacy of the government of the United States was in the main considerate and helpful at this time, the conduct of some of her individual citizens left much to be desired. San Juan del Norte, or Greytown, was bombarded by the United States sloop-of-war Cyane, and burned to the ground by a landing party from that vessel, on 13 July 1854, the excuse offered for this violence being an alleged insult to the United States minister to Nicaragua. William Walker, a native of Nashville, Tenn., of Scotch descent, sailed from San Francisco, Cal., 4 May 1855, on the brig Vesta, with 58 men, to take part in the little wars of political factions in Nicaragua. Before long he found himself at the head of a considerable force composed of Americans, European adventurers, and natives, with whose aid he became master of the situation, forced the people to elect him to the presidency, and was inducted into office 12 July 1856. Attacked by the combined forces of Salvador, Costa Rica, Guatemala, and Honduras, he was obliged to capitulate. Returning in 1860 with another filibustering expedition (this time landing at Trujillo on the coast of Honduras), he was captured, tried by court-martial, sentenced to death, and executed.

Renewal of the efforts to achieve Central American unity was due in a measure to President Barrios of Guatemala (1873-85). For the further development of this design; the attempt (1895-8) to unite Honduras, Nicaragua, and Salvador; the treaty of 20 Jan. 1902, mentioned above, and events of the years 1885 to 1903, we refer our readers to separate articles on each of the five republics.

Mountain System.—The mountains described as extending directly at right angles to the cordilleras of North and South America are part of a great Antillean system. East and west mountain ranges of this type occur in the Isthmus of Panamá, Costa Rica, and the eastern parts of Nicaragua, Honduras, Guatemala, and the adjoining provinces of Mexico; also along the Colombian and Venezuelan coast of South

CENTRAL AMERICA

America, and in Cuba, Haiti, and the other islands of the Greater Antilles. Two submarine ridges stretching across the Caribbean Sea, between Honduras and the Sierra Maestra range in Cuba, and from Cape Gracias á Dios to Jamaica, are regarded as being genetically a part of the same system. The interesting suggestion is made by Mr. Robert T. Hill that the Caribbean lands before the close of the Tertiary period were much more extensive than now. "Geological surveys," he says, "have proved that during this time of expanding Antillean lands, the Gulf Stream flowed out from the American Mediterranean as now, but through a passage across the northern half of Florida. . . . The great banks of the western Caribbean Sea were at that time projections of land probably connecting Central America with Jamaica and possibly Cuba." Therefore Florida, the Bahamas, the Antilles, and at least the eastern part of Central America, totally severed from North and South America, together formed either one great island, or, more probably, a group of several large islands, with volcanic chains on the east and west (see CARIBBEAN SEA), and with characteristic rocks, calcareous and igneous, which have weathered into soils of unsurpassed fertility (see CUBA).

Volcanoes.—A Central American group of volcanoes, with 31 active craters crossing the western ends of the Antillean folds, occurs on the Pacific side of the republics, from Costa Rica to Guatemala. The central and eastern region is shown by the observations of Mr. P. W. Chamberlain, member of the American Society of Civil Engineers, to be well watered, with comparatively low mountains, very rich soil, and a good climate—except the Caribbean coast which, from Trujillo downward, including the Mosquito territory, is hot and insalubrious. Lack of communication and means of transportation has led to the abandonment of the intermediate lands, the most attractive and extensive part of the country, nearly or quite beyond the influence of the volcanic area. The easily approachable volcanic strip (in Nicaragua, for example, between the lakes and the Pacific) has been preferred hitherto as a place of residence. Thus one who visits only the principal cities in the centre of population, seeing nothing of the naturally richer and better districts, receives the impression that this is the most volcanic region of the globe. The largest volcanoes are in the north—for example, the Acatenango, 14,000 feet elevation, in Guatemala, and in the south—for example, the Irazú and Turealba, of 12,000 feet, in Costa Rica. In Nicaragua the highest, El Viejo, is only 5,800 feet above sea-level. In Guatemala we find the volcanoes, Fuego, Cerro Quemado, El Chato, etc.; in Salvador, Ilopango, San Salvador, and others. Earthquake shocks in the republics last mentioned, and also in Costa Rica, have been, as a rule, very severe, while those of Nicaragua are comparatively mild in force and extend over limited areas. The recorded seismic disturbances that have affected the whole country are those of 1538, 1648, 1651, 1844, and 1865. Central Nicaragua, east of the lakes, Nicaragua and Managua (the largest bodies of fresh water in Central America) is regarded as nearly immune from such disturbances. Nicaragua's centre of volcanic activity is a ridge, the Sierra de los Morabios, between the Cosigüina (whose out-

burst on 2 Jan. 1835 was considered the grandest on record before the eruption of Krakato in 1883), and the Momotombo. In this ridge are 10 vents, two of which, the Telica and Momotombo, are active, and none can be properly called extinct. Southeast from the Morabios ridge is the isolated active volcano Masaya. The Orosé is in Costa Rican territory. The island of Ometepe in Lake Nicaragua has two volcanoes, one dormant, the other extinct. Comparatively few members of the Central American chain of volcanoes are of the type with which fierce eruptions are commonly associated; moreover, the fertility of the soil on their flanks, due to the high percentage of soda and potash contained in volcanic dust, tempts agriculturists to remain in this neighborhood. It will be noted with interest, also, that the proposed line of the intercontinental railway keeps near to the Pacific coast. It is probable, therefore, that for many years yet to come the best part of Central America—the central districts—will receive only secondary consideration, remaining comparatively undeveloped.

Intercontinental Railway and Isthmian Canal.—Two subjects of great importance to this region are: (1) The plan to connect the railway systems of North and South America at the Isthmus of Panamá, so that the political and commercial capitals of all, or nearly all, American republics may be closely united by land routes. (2) The proposed shortening of the highways of the sea between the same nations by the construction of a ship canal (see ISTHMIAN CANALS). An all-rail route from New York to Buenos Ayres would be approximately 10,471 miles in length, of which about 5,000 miles remain (1903) to be constructed. The first International American Conference (1889-90) recommended the construction of the railroad necessary to join existing lines and give through rail communication; President Harrison approved the project (in a message, 19 May 1890); engineers were put in the field to make surveys, which were completed in 1895; in March 1903, a commissioner from the United States was sent to the Central and South American countries to ascertain the condition of lines in operation and the prospect for the completion of the undertaking. As shown by surveys published in 1902, the line will join an extension of the Mexican railway system on the northwestern frontier of Guatemala; it will have 230 miles in Guatemala, 220 in Salvador, 70 in Honduras, 224 in Nicaragua, and 363 in Costa Rica; in South America it will follow the curvature of the Pacific coast, though not closely, to Cuzco, Peru; and, in combination with the extensive systems of Argentina and Chile, will connect the Sierra of Bolivia with the southern capitals, Santiago and Buenos Ayres, with extensions to Rio de Janeiro and Asuncion. At present the principal railway lines in Costa Rica, Guatemala, and Honduras run from the interior to the ports. Guatemala leads, with 342 miles of railroad, Costa Rica has 222, Nicaragua 176 miles, Salvador 132 miles, and Honduras 50 miles. Such is the lack of transportation facilities between the countries of Spanish-America, a letter or express package from one of the Central American states, or even North America, intended for some of the South American republics, is sent first to Europe, to be forwarded to its destination; but the region now so isolated will lie at

CENTRAL AMERICA

the crossroads of two great routes of traffic in the future.

Races.—Mr. H. H. Bancroft is authority for the statement that the most numerous class of the population in Central America, next to the pure Indians, are the *ladinos*, most of whom are half-breeds, including mestizos (the offspring of white and Indian), mulattoes, quadroons, octo-rooms, and zambos (or sambos — the offspring of Indian and negro). "The *ladino* class furnishes the domestic servants, muleteers, small farmers and tenants, herdsmen, and not a few beggars and robbers. . . . A considerable number of *ladinos*, however, become mechanics and traders, and many have attained high positions in the Church and the state, and become distinguished for their talents and abilities. The zambos and other mixtures of the negro race reside in the coast districts," doing the heaviest work. The Caribs, who have increased greatly in numbers since they were transported from St. Vincent by the British, are more active and industrious than the sambos. Salvadoran society, according to the same authority, has a small proportion of whites, while the mass of the population is Indian, *ladino*, and zambo; in Guatemala he found (1883) that the Indians numbered 750,000, *ladinos* or mestizos 430,000, white persons 10,000, negroes 8,000, and foreigners 2,000; in Honduras that "the amalgamation of races has almost obliterated the line distinguishing whites from blacks." In Costa Rica, on the other hand, the inhabitants are mainly white, and to a large extent descendants of Spaniards from Galicia, the Indians being distinct from the civilized race, and the negroes living almost exclusively on the coast.

Comparative Statement of Area, Population, Commerce, Imports, and Exports, etc.—The following comparative statement of the commerce, imports and exports, and interior developments of the five republics is based upon the latest complete statistics, equally representing all of the countries, that are now available — those for the year 1901:

1. Costa Rica: Area 22,000 square miles, population 310,000. Imports during 1901 were valued at \$4,410,422.45, while the exports rose to \$5,583,197.91, giving an excess of exports over imports of \$1,172,775.46. Coffee exports reached a total value of \$2,823,291.32, and bananas were shipped valued at \$1,532,581.78 (nearly 4,000,000 bunches). Gold coin and bullion exported aggregated \$682,409.23. Importations from the United States amounted to \$1,946,726, while exports to that country for the same period aggregated \$2,990,550. In the trade for 1900 and 1901 the United States shared to the extent of about 50 per cent in the import lists of the republic, as against 43 per cent in 1899, Germany's trade having fallen off one and a half points, while that of Great Britain advanced from 19.6 per cent to 22.6. Two issues of bonds were authorized during the year, the proceeds to be used in developing the railway interests of the country. On the other hand, Costa Rican bonds to the value of 642,300 *colones* (a *colon* equals \$0.465 in United States gold or silver) were incinerated, having been issued in 1897 and 1899, and subsequently redeemed. A commercial treaty with France, providing for the reciprocal exchange of tropical products between Costa Rica, the French colonial possessions, and France, at the lowest rate of customs duties, was signed by

representatives of the two countries interested on 7 June 1901, at San José. Trade conditions being reported as unfavorably affected by the decline in the price of coffee in foreign markets, a law abolishing the export duty on that article became operative on 1 Sept. 1901. According to a governmental decree, import duties on foreign goods brought into the republic were raised 50 per cent after 28 April 1901. A rapid development in the tobacco industry was noted. The net earnings of the Costa Rica Railway Company were sufficient to meet the interest on the capital invested, and to increase the reserve fund. In March the circulation of 30,000 *colones* was authorized by presidential decree. These gold coins were made at the United States mint in Philadelphia.

2. Guatemala: During 1901 Guatemala exported to the United States products valued at \$3,512,445, as compared with \$2,402,978 in 1900. The imports from the United States were worth \$1,424,814, while in the previous year they were worth only \$785,462. The tariff schedule of 1900 continued in force during the first six months of 1901. Certain exemptions were, however, made in favor of imports from the neighboring republics of Salvador, Honduras, Nicaragua, and Costa Rica. A reduction of 30 per cent, provisionally granted in the customs tariff to merchandise imported from Europe and the United States, was extended for another period of six months. On 12 Aug. 1901 a decree was issued by the government providing that the duty of six *pesos* (Guatemalan *peso* equals \$0.361) per quintal on coffee exported from the republic should remain in force until 30 June 1902. The crop of 1901 was estimated at 480,000 quintals. A decree in January 1901 authorized the appointment of four teachers, two men and two women, who should be sent to the United States at the government's expense for the purpose of studying the methods of instruction in that country. With a view to the proper exploitation of the forest lands, special regulations were enacted. The president of the republic, in his annual message to the national Legislative Assembly at the opening of its regular session in 1901, noted the improvement in public highways, the development of agriculture, and in general the moral and material advancement of the country. In January definite steps were taken for the completion of the Northern Railway, which will be of great benefit in the development of Guatemala's latent resources, and to this end a contract was made with the Central American Company. The government of Guatemala proposed, as a guaranty for the cost of construction, an issue of 6 per cent gold-bearing bonds to the amount of \$4,000,000, redeemable within 10 years, the road and rolling-stock to become eventually the property of the government. A contract was entered into (April 29) between the government and the Guatemala Central Railroad Company for the extension of the Patulul branch of that road, to connect the Guatemala Central and the Occidental Railroad, thus placing the capital in direct communication with the northern and western provinces. A tramway between Guatemala city and Guarda Viejo was authorized, the concession including the free importation of the necessary cars. To prevent mining monopolies, the national Legislative Assembly prohibited the holding of more than one mine by one individual in his own name, or of more

CENTRAL AMERICA

than three mines by any corporation of three or more members. The area of Guatemala is 47,810 square miles; its population in 1897 was 1,501,145.

3. Honduras (British): Area 8,000 square miles; has about 32,000 inhabitants. See BELIZE; HONDURAS (*British*).

Honduras (Republic of) has an area of 46,400 square miles. Population 543,741. In the fiscal year 1901 the exports of Honduran products to the United States were valued at \$1,258,317, as compared with \$988,606 in the preceding year, while the imports from the United States in the same years were valued at \$1,115,009, and \$1,181,453, respectively. Other countries furnishing imports were: Germany, to the value of \$486,373, England \$471,650, France \$101,855, British Honduras \$152,800, other Central American states, \$107,402. Leading exports: Precious metals, \$2,279,115.50; fruits, \$1,945,388; cattle, \$557,316; coffee, \$275,193; cabinet woods, \$274,255; tobacco, \$213,423; hides and skins, \$182,345; indigo, \$107,365; sundries (hats, wheat, salt, etc.), \$177,503. Seventy per cent of the exports were taken by the United States, Germany and the Central American republics dividing the balance. Exports exceeded imports by \$2,014,000. Net government receipts from all sources, \$3,017,273.40; expenditures, \$2,840,397.21. Payments on the national debt during the year, \$805,144.73, leaving the total indebtedness of the republic at the beginning of 1902, \$1,285,207.75. The coinage of 1901 exceeded that of 1900 by \$3,948.52. During the year 2,999 ships (total capacity, 491,199 tons) entered the ports. These vessels brought 5,168 passengers, and carried away on their outward voyages 3,928 passengers. Exports of ores from the mines amounted to \$470,293.50 more than in 1900. The quantity of mail handled by the post-office service was greater than in the previous year. The telegraph system was extended by 120 miles of additional wires, making the total length of the telegraph lines 3,166 miles. During 1901 the number of messages sent was 543,599, or 31,045 more than in 1900. A report of the secretary of war presented to the national congress showed the total strength of the army to be 40,079 men. Subjects of national importance were: the canalization of the Patuca River, the systematic culture of rubber, and the construction of a line of railway from Omoa to the Bay of Trujillo—the concessionaires in the matter of the railway being citizens of the United States.

4. Nicaragua: Area, 40,000 square miles, population, 360,000. Exports to the United States in 1901 were of the value of \$2,035,636, as compared with \$1,520,266 in 1900. Imports from the United States were of the value of \$1,482,194 and \$1,817,869 in 1901 and 1900 respectively. Total foreign commerce of the republic in the year 1900: imports, \$2,487,952; exports, \$2,836,557. In 1901 Managua was made headquarters of the German consul-general, who exercises control over German consulates in Salvador, Honduras, and Costa Rica. At the close of 1900 the total debt of the republic was approximately \$4,000,000, of which \$2,666,000 represented internal indebtedness, and about \$1,334,000 the foreign debt. During the year the government floated a loan of \$451,000, the bonds being purchased by local merchants and busi-

ness men. A treaty of reciprocity between Nicaragua and Chile provided for the free admission of certain articles at the ports of those countries. With a view to developing trade relations with Spain, a special exhibition of Spanish products was established at Managua in the National Museum. The work of connecting the eastern and western railway systems was continued; a syndicate of citizens of the United States undertook to build cart-roads to certain mines, and purchased the exclusive rights of navigating the largest river in Nicaragua, the Segovia; a concession for a railway from Matagalpa to the head of navigation was granted to a citizen of the United States; a concession was granted to a company for the establishment of a line of steamships, to run between the Caribbean ports, and carry the mails between Bluefields (formerly written Blewfields) and New Orleans; a dock to cost \$150,000 and to be built at Corinto was contracted for, and the government also granted a concession for the establishment of a thread and cloth mill. Increased attention was given to the cultivation of the rubber-tree, the only important agricultural industry of the Caribbean coast country having been until recent years the growing of fruits, principally bananas. There was but one large manufactory of sugar.

5. Salvador: In order to improve the interstate relations of the republics of Central America, a session of delegates from the various countries was held in the city of Salvador in February 1901, at which it was agreed that the products of the states there represented should enjoy reciprocal free entry. The exports in 1901 included 326,588 sacks of coffee, worth \$8,308,466 in silver. Other products exported were of the value of \$2,647,579, silver. Imports during the same period were valued at \$2,615,150.64, gold, which, with exchange at 150 per cent, equals \$6,537,876.60 silver. Exports to the United States in 1901 were worth \$1,037,715, as compared with \$738,674 in 1900. Imports by Salvador from the United States in 1901 were valued at \$738,722; in 1900 they were \$679,440. At the beginning of the year 1901 the republic of Salvador was reported to be entirely free of foreign debt, bonds covering such indebtedness having been redeemed and destroyed in November 1900. Receipts from taxation in 1901 were: Customs duties, \$4,168,564.59; tax on liquors, \$1,814,761.99; sundry taxes, \$315,283.14; telegraphs, post-offices, etc., \$258,111.84; total, \$6,556,721.56. To this sum there must be added \$1,133,958.17 (from deposits, licenses, etc.), which, added to the balance on hand at the beginning of the year, makes the total receipts \$7,825,764.40. Disbursements in 1901 were: Legislative, executive, and judicial branches of government, \$4,378,948.31; payment of different credits, \$3,197,956.09; return of deposits and other expenditures, \$63,986.77; balance 31 Dec. 1901, \$184,873.23; total \$7,825,764.40. The public debt on 31 Dec. 1901 was \$8,325,904.43. Salvador's area is 7,255 square miles; its population, according to the census of 1901, was 1,106,848.

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CENTRAL CITY — CENTRAL OF GEORGIA RAILWAY COMPANY

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MARRION WILCOX,
Authority on Latin-America.

Central City, Colo., a city and county-seat of Gilpin County, situated on the Union P. R.R., 20 miles southwest of Boulder. It lies in a gold-mining district of the Rocky Mountains and its industries are chiefly connected with the development of the mines, which have been worked for about half a century. Pop. (1900) 3,114.

Central College, a coeducational institution in Fayette, Mo., organized in 1857, under the auspices of the Methodist Episcopal Church South; reported at the end of 1902: professors and instructors, 10; students, 201; volumes in the library, 6,500; value of all property, \$320,000.

Central Falls, R. I., a town in Providence County, situated on the Blackstone River, and the New York, N. H. & H. R.R., 4½ miles north of Providence. It has a number of large manufacturing establishments, with an aggregate capital of \$3,389,000, including cotton, woolen, silk, and leather factories. The river supplies excellent power. There are several churches, newspapers, and a national bank. Pop. (1900) 18,167.

Central Force, a force which constantly urges the body upon which it acts toward the same fixed point or "centre." Central forces are specially important in physics and mechanics, because systems in which the forces are all of this character are "conservative." See DYNAMICS; ENERGY, CONSERVATION OF.

Central of Georgia Railway Company, The. *History.*—The Central of Georgia Railway was incorporated as The Central Railroad & Canal Company of Georgia with a capital stock

of \$1,500,000 20 Dec. 1833, and completed between Savannah and Macon 13 Dec. 1843, a distance of 190 miles. In 1835 its corporate name was changed to "The Central Railroad and Banking Company." The line was completed to Macon and the first train passed over it to that city on 13 Oct. 1843, and opened for business 18 days later. The total cost was \$2,581,723, which included depots, motor power, and rolling stock, an average of \$12,702 per mile.

Macon & Western Railroad.—While the Central was building toward Macon, the Macon & Western Railroad, chartered as the Macon & Monroe (1833), was being pushed southward to Macon, and northward to Atlanta to connect with The Western & Atlantic. The road, afterward extended to Atlanta, 103 miles long, and finally controlled by Central capital, constitutes, with purchased connections, the northern wing of the "Y" which ends at Chattanooga.

Southwestern Railroad.—This road (1845) was rapidly constructed from Macon to Eufaula, Ala., on the navigable Chattahoochee river, and threw out a number of branches, one of which, as the Muscogee Railroad (1856) reached Columbus, Ga. The Southwestern, leased by the Central (1869), constitutes the south wing of the original "Y." The Macon & Western, the north wing, was consolidated with the Central in 1872.

Mileage.—The main stem of the system, Savannah to Macon, expressed without fractions, is 191 miles long; the north wing, Macon to Atlanta, 103 miles; the south wing, Macon to Eufaula, Ala., 143. Both wings have been extended, the south by a line to Lockhart, Ala., from Smithville, Ga., 176 miles, and the north by a line from Griffin, Ga., to Chattanooga, Tenn., 198 miles. The Central system now covers in Georgia 1,308 miles; in Alabama, 564; and in Tennessee, 4½; a total of 1,877.83 miles of main track, with 20 miles from Greenville to Newnan, Ga., and 10 miles on the Upper Cahaba Branch in Alabama under construction. The northern terminus of the Central system is Chattanooga; the western, Birmingham; the southern, Lockhart, Ala.; and the eastern, Savannah.

Organization.—The following lines constitute The Central of Georgia Railway:

OWNED — UNDER TRUST AND CONSOLIDATED MORTGAGES.

Savannah to Atlanta, Ga.,	294.73
Gordon to Milledgeville, Ga.,	17.32
	312.05

OWNED — UNDER DIVISIONAL AND CONSOLIDATED MORTGAGES.

Dover to Bruton, Ga.,	77.02
Milledgeville to Covington, Ga.,	64.57
Macon Junction to Athens, Ga.,	101.78
Columbus, Ga., to Andalusia, Ala.,	137.96
Carrollton, Ga., to Chattanooga, Tenn.,	137.57
Chickamauga to Durham, Ga.,	17.54
Lyerly, Ga., to Toles Hollow, Ala.,	9.37
	545.81

OWNED — UNDER CONSOLIDATED MORTGAGE.

Savannah to Tybee, Ga.,	17.70
Meldrim to Lyons, Ga. 58.09 miles leased to Ga. & Ala. R. R. Co.	
Barnesville to Thomaston, Ga.,	16.25
Griffin to Carrollton, Ga.,	60.00
Covington to Porterdale, Ga.,	4.05

CENTRAL INDIA AGENCY — CENTRAL PARK

OWNED — UNDER CONSOLIDATED MORTGAGE — (Continued).	
Americus to Columbus, Ga.,	62.34
Columbus to Greenville, Ga., (Narrow Gauge),	49.51
Columbus, Ga. to Birmingham, Ala.,	156.34
Opelika to Roanoke, Ala.,	36.12
Montgomery to Eufaula, Ala.,	79.65
Eufaula to Ozark, Ala.,	60.00
	541.96

Grand Total Owned

1,399.82

LEASED.

Augusta & Savannah Railroad:	
Millen to Augusta, Ga.,	53.21
Southwestern Railroad:	
Macon, Ga., to Eufaula, Ala.,	143.60
Fort Valley to Columbus, Ga.,	71.00
Fort Valley to Perry, Ga.,	12.50
Smithville, Ga., to Columbia, Ala.,	85.01
Cuthbert to Fort Gaines, Ga.,	20.50
Chattahoochee & Gulf Railroad:	
Columbia to Lockhart, Ala.,	91.47
	477.29
Owned Track On Leased Right Of Way	.13
Trackage Rights	.59
	477.91
Total miles operated,	<u><u>1,877.83</u></u>

Thirty railroads have been acquired by the Central system through charter, purchase, consolidation, or lease, and the following are embraced in it: Augusta & Savannah; Bruton & Pineora; Buena Vista & Ellaville; Central Railroad & Banking Company of Georgia; Rome & Columbus; Chattanooga, Rome & Southern; Columbus & Western; Covington & Macon; Dover & Statesboro; East Alabama; East Alabama & Cincinnati; Goodwater & Birmingham; Macon & Atlantic; Macon & Northern; Macon & Western; Middle Georgia & Atlantic; Milledgeville & Eatonton; Milledgeville & Gordon; Mobile & Girard; Monroe; Montgomery & Eufaula; Muscogee; North & South Georgia; Savannah & Memphis; Savannah & Western; Savannah, Dublin & Western Short Line; Southwestern; Upson County; Vicksburg & Brunswick; and Greenville & Newnan.

Funded Debt.—In 1892 the Central passed into the hands of a receiver and was sold in 1895, under a reorganization scheme to a committee composed of Thomas F. Ryan and Samuel Thomas. The funded debt 30 June 1905 was \$48,863,000.

Earnings.—For the year ending 30 June 1905 the general income account was as follows:

Total earnings,	\$10,135,054.59
Operating expenses,	7,417,966.04
	\$2,717,088.55
Net earnings,	248,364.00
Other income,	
	\$2,965,452.55
Total net income	2,110,935.00
Total payments	
	\$854,517.55
Surplus	<u><u>\$854,517.55</u></u>

Equipment and Traffic.—The Central system requires 253 locomotives, 229 passenger cars, 7,895 freight cars, and 263 service cars in its operation, and more than 10,000 employees. The company transported during the year ending 30 June 1905 3,242,110 passengers and 4,951,686 tons of freight.

J. F. HANSON,
President.

Central India Agency, the official British term for a collection of states in Hindustan, consisting of four groups or agencies, namely, Bundelkhand, Bhaghelkhand, Gwalior, and Ni-

mar and Malwa, covering an area of 77,808 square miles, under the ultimate charge of the governor-general's agent at Indore. The largest individual states are Gwalior, Indore, and Bhopal. Pop. (1901) 8,501,883.

Central Park, the most noted park in New York city. It contains 840 acres and extends from 59th Street to 110th Street, and from Fifth Avenue to Eighth Avenue. In 1856, the year of its purchase by the city, the land now constituting Central Park was occupied by shanties, bone-boiling establishments, piggeries, and pools of offensive stagnant water which rendered the neighborhood anything but park-like. The first full year's report of the men who were given the work of turning this ground into a park, contains the following description of its condition:

"It was already a straggling suburb, when purchased by the city, and a suburb more filthy, squalid and disgusting can hardly be imagined. A considerable number of its inhabitants were engaged in occupations which are nuisances in the eyes of the law and forbidden to be carried on so near the city. They were accordingly followed at night in wretched hovels half hidden among the rocks.

"During the autumn of 1857, 300 dwellings were removed or demolished by the commissioners, together with several factories and numerous 'swill milk and hog-feeding establishments.' Ten thousand loads of stone were also taken off the land and used to build a rough enclosing wall."

This description helps one to appreciate the vast amount of work, and artistic planning which has been necessary to bring the park to its present state of beauty and attractiveness, and it is interesting to see how fully the prophecy of a park commissioner, who wrote in 1868, has been fulfilled:

"But we who are in the middle of life," he says, "can never know all its beauty. That is reserved for those for whom we have planted these shrubs and trees, and spread these level lawns. These trees will arch over many happy generations, and thousands who are not yet born will enjoy the sweet green of the grass; and it will ever habitually serve to keep the memory of its founders green."

The central site was finally selected despite its unpromising topography, in preference to the one first proposed at 66th Street on the East River—the Jones' Wood site—because it was central and spacious. It was also thought that the great expense of turning it into building lots—the extensive filling of low, swampy ground, and blasting away of ledges—would enable the city to purchase the land at a low figure. Including a number of acres of water surface, comprising the two reservoirs belonging to the Water Department, the cost was about \$7,500 an acre. The total acreage, including the subsequent extension to 110th Street, was 843, and the price paid \$6,348,959.90.

There has been spent in bringing the park to its present condition somewhere between \$25,000,000 and \$30,000,000.

The special committee appointed by the Board of Aldermen to select the most desirable park site pronounced emphatically in favor of "the Central Park," stating their opinion that "it could be made to compare favorably with

CENTRAL PARK

the most celebrated public grounds of the chief cities of Europe, not excepting Hyde Park of London, the Champs Elysées of Paris, the Prater of Vienna, the Cascine of Florence, the Corso of Rome, the Prado of Madrid, or even on the American continent, with the spacious plazas of Havana or the lovely botanical gardens of Rio de Janeiro."

It was freely predicted by the opponents of the park that it would prove a white elephant on the hands of the city; that it could never be made into a decent-looking park, and was an unnecessary extravagance which the city did not need and could not afford.

The largest settlement of the park seems to have been along the Eighth Avenue side. Mount St. Vincent was included within the park borders, situated just west of Fifth Avenue at 105th Street, on the old Boston post road, which ran diagonally through the park. The land and buildings (now the headquarters of Commissioner Wilcox) forming the State arsenal, were subsequently purchased by the city and added to the park in 1867, the price paid being \$275,000.

Owing to the lack of funds no work was done in improving the land until 1857. In April of this year the legislature authorized the issuance of bonds and in the following June a tentative beginning was made on the park. Preliminary surveys had been carried out by Egbert L. Viele, the first engineer to the commissioners, but they soon decided that it would be desirable to offer a series of prizes to outside architects for designs for the formal laying out of the land. In 1857 such an announcement was made and on April 1, 1858, 30 designs were submitted. That of Messrs. Olmsted & Vaux was chosen, and they were awarded the first premium of \$2,000. In 1857 Mr. Olmsted had been appointed superintendent to the board; George E. Waring, agricultural engineer; Samuel I. Gustin, nurseryman, and several other landscape offices had been created and filled.

In 1858 Mr. Olmsted was promoted to architect-in-chief at a salary of \$2,500 a year, and the other offices abolished or subordinated to his.

The work of putting the successful design into execution was begun by Mr. Olmsted, Calvert Vaux, and J. W. Mould in June 1858. The original plan has been pretty closely adhered to, during the 40 odd years of the park's existence, although there have been times when strong efforts were made to alter it, and even to remodel some of the previous work. In 1871 when the Central Park commissioners were legislated out of office, and a board of public parks for the whole city instituted, such an attempt was made, one of its features being an extensive thinning of the trees.

Until 1871 the history of the park was an uneventful one. Most of the commissioners had served on the board since its first year, and except for family squabbles over the details of management and construction, the improvements were carried on without interruption practically in the entire charge of Mr. Olmsted. The difficulties which began to interfere with the efficiency of the department after its political organization in 1871 are indicated by the following extract from a pamphlet by Mr. Olmsted, who was subsequently made a commis-

sioner and president of the board shortly prior to his dismissal:

"As superintendent of the park," he says, "I once received in six days more than 7,000 letters of advice as to appointments, nearly all from men in office." Delegations from various political organizations came to find out "what share of his patronage they could expect," and in order to make him as little trouble as possible in its parceling out "they took the liberty to suggest that there could be no more convenient way than that you should send us our due quota of tickets, if you please, sir, in this form, leaving us to fill in the name." Here a pack of printed tickets was produced, which proved to be blank appointments, bearing the signature of Mr. Tweed. "That," continued the spokesman of the delegation, "was the way we arranged it last year, and we don't think there can be anything better."

There seems to have been some misconception, during the early years of the park, as to its real purpose, and considerable jealousy of its regulations. In April 1864, for instance, one of the regiments of the first division of the National Guard, despite the vehement opposition of the park keepers, marched through one of the gates and proceeded to drill upon the green. Another regiment subsequently attempted to do the same thing.

An interesting item in the report for 1863 is the announcement that 14 European sparrows, "*moineau*, of France," were let loose in the park in the spring of that year. This original 14, apparently the pilgrim fathers of the present local settlement, must now be represented by several million.

The paving of Fifth Avenue up to the park was completed in 1863. Previous to this, especially in wet weather, the approaches had been extremely bad, and the completion of the Fifth Avenue paving led to an immediate increase in the use of the park for driving. In its early days guards were stationed at each of the park gates, and a part of their duty was to count the number of persons passing in. In 1861 the result of the count was 1,863,263 pedestrians, 73,547 equestrians, and 456,849 carriages, the total number of visitors being estimated at 2,404,659.

"For the purpose of ascertaining the nature of the existing vegetation," says the first annual report (1857-8), "a botanical survey of the park has been made. First, to learn how far it can be made available in the projected improvements and to ascertain what plants will prove most flourishing if transplanted to this ground, and second to discover what alterations the soil will require in order to admit of an increased variety."

This report details about 70 species of trees, shrubs, and vines. Among the trees were included maples, beech, dogwood, chestnut, catalpa, red birch, persimmon, ash, locust, black walnut, red cedar, sweet gum, sycamore, poplar, American aspen, oak, and elm. All told, there were about 150,000 trees and shrubs.

Regarding the present vegetation there seems to be no available data, no continuous record of the planting having been kept nor any detailed botanical study of it made during recent years.

The soil of the park was never good in quality, nor abundant enough to support the veg-

CENTRAL PROVINCES — CENTRAL RAILROAD OF NEW JERSEY

regation of a park. For this reason the public had to be excluded from the meadows and lawns, as a single day's trampling of the grass nearly destroyed it. In 1903 a systematic renovation of the soil was undertaken, and continued until nearly the whole planted area was covered with loam, carted from Long Island, at an expense of upward of \$2,000,000.

Central Provinces, a part of British India, presidency of Bengal, occupying a position about the middle of the peninsula. Their total area is computed to be 115,936 square miles, of which 86,617 square miles are British territory, and the rest the territory of native protected states, 15 in number. They contain much waste land and jungle and the cultivated area is small, little more than one fourth of the British territory being turned to account, and more than one half of the remainder being uncultivable. These provinces became a separate administration in 1861, and are under the authority of a chief commissioner. For administrative purposes they are divided into four commissionerships, Jabalpur (Jubbulpore), Nagpur, Nabada (Nerbudda), and Chhattisgarh (Chutteesgurh), and these contain 19 districts.

Central Railroad of New Jersey, a system operated in New Jersey, New York, and Pennsylvania, by the Central Railroad Company of New Jersey, and controlled by the Reading Company which owns over 52.9 per cent. of the capital stock. The company was formed 22 Feb. 1849 for the consolidation of the Elizabeth and Somerville Railroad Company and the Somerville and Eastern Railroad Company, and has since absorbed the Newark and New York Railroad Company, the Perth Amboy and Elizabeth Railroad Company, the Constable Hook Railroad Company, the Manufacturers Railroad Company, the South Branch Railroad Company, the High Bridge Railroad Company, the Longwood Valley Railroad Company, and the Lake Hopatcong Railroad Company. In 1905 the company owned, leased, and controlled 641.23 miles of railroad. The lines owned amounted to 154.84 miles; proprietary lines, which had been practically absorbed, to 216.24 miles; leased lines to 211.60 miles; a jointly leased line to 38.04 miles, and trackage rights to 20.21 miles. The lines owned had 154.84 miles of first track, 96.16 miles of second track, 30.36 miles of third track, the same amount of fourth track, 234.56 miles of side track, total 546.28 miles of track, of which 527.60 miles were steel rails of 56 to 80 lbs. per yard, and 18.68 miles, iron rails of 50 to 70 lbs., the gauge being 4 ft. 8½ inches. The proprietary roads had 216.54 miles of first track, 12.63 miles of second track, 61.27 miles of side track, total 290.44 miles of track of which 275.35 miles were steel rails and 15.09 miles iron. The leased roads prior to a merger of 4 March 1905, had 247.74 miles of first track, 104.09 miles of second track, 9.46 miles of third track, 174.90 of side track, total 536.19 miles of track, of which 521.22 miles were steel and 14.97 miles, iron rails. The jointly leased road had 38.04 miles of first track, 38.04 miles of second track, 36.30 miles of side track, total 112.38 miles of track, of which 109.05 miles were steel and 3.33 iron rails. The roads with trackage rights had 20.21 miles of first track, 12.35 miles

of second track, 5.37 miles of side track, total 37.93 miles of track, all of steel rails. Grand total, 1,523.22 miles of track operated, of which 52.07 miles were of iron rails and the rest steel. The rolling stock consisted of 478 locomotives, 382 passenger coaches, 84 combination cars, 66 baggage, mail, and express cars, 3 horse cars, 20,367 freight cars of all kinds, and 486 service cars. The marine equipment consisted of 4 steamboats; 9 ferryboats; 11 tugboats; 24 car floats; and 15 sea-going coal barges. Contracts for delivery during 1906 included 15 six-wheel switching locomotives, 1,000 steel coal cars, 2 ferryboats, 2 car floats, 2 steam derricks, and 100 refrigerator cars.

The lines owned are: Jersey City to Phillipsburg, N. J., 72.30 miles; Communipaw to Newark, N. J., 6.22 miles; Brills to Passaic River, N. J., 1.68 miles; Centreville to Constable's Hook, N. J., 1.95 miles; Elizabethport to Perth Amboy, N. J., 12.13 miles; Elizabethport to Brills, N. J., 5.51 miles; Elizabeth to Elizabeth Docks, N. J., 2.84 miles; Somerville to Flemington, N. J., 15.78 miles; High Bridge to Port Oram, N. J., 25.17 miles; German Valley to Chester, N. J., 4.51 miles; Hopatcong Junction to Nolan's Point, N. J., 5.56 miles; besides two spurs to factories; total 154.84 miles. The principal proprietary roads are: Cumberland and Maurice River Railroad, with an extension, 22.43 miles; Freehold and Atlantic Highlands Railroad, 24.47 miles; Navesink Railroad, 4.66 miles; New Jersey Southern Railroad, 75.66 miles; Sound Shore Railroad, 6.17 miles; Toms River Railroad, 7.57 miles; Toms River and Barnegat Railroad, 14.71 miles; Vineland Railroad, 46.82 miles; total with various smaller branches, 216.24 miles. The leased lines include: the Lehigh and Susquehanna Railroad, 163.79 miles; the Nesquehoning Valley Railroad, 16.66 miles; Ogden Mine Railroad, 9.86 miles; Tresckow Railroad, 7.60 miles; Dover and Rockaway Railroad, 5.12 miles; Wilkes-Barre and Scranton Railroad, 4.37 miles; Hibernia Mine Railroad, 4.20 miles; prior to 4 March 1905, when they were merged in the Lehigh and New England Railroad, the company operated the Lehigh and Lackawanna Railroad, 26.18 miles, and the Wind Gap and Delaware Railroad, 9.96 miles. It leases jointly with the Pennsylvania Railroad Company the New York and Long Branch Railroad, 38.04 miles, and has trackage rights on the Allentown Terminal Railroad, 3.27 miles; on the Union Coal Railroad — Union Junction to Minooka Junction, Pa., 9.66 miles; on the Lehigh and New England Railroad — Bangor Junction to Bender Junction, Pa., 2.08 miles; and on the Philadelphia and Reading Railroad — Tamanend to Silver Brook, Pa., 5.20 miles. The rentals of the leased lines in 1905 were: Allentown Terminal Railroad, \$13,500; Dover and Rockaway Railroad, \$11,000; Hibernia Mine Railroad, \$12,500; Lehigh and Susquehanna Railroad, \$2,262,299.66; Lehigh & Lackawanna Railroad, \$16,467.37; New York & Long Branch Railroad, \$124,159.61; Ogden Mine Railroad, \$23,000; Wilkes Barre & Scranton Railroad, \$65,378.10; total of rentals, \$2,528,304.74. The gross earnings for the fiscal year ended 30 June 1905 amounted to \$21,676,536.96, the operating expenses to \$11,946,762.24,

CENTRAL UNIVERSITY — CENTRAL VERMONT RAILWAY COMPANY

leaving a balance of net earnings, \$9,729,774.72; with \$1,119,197.87 income from investments; this was increased to \$10,848,972.59. The gross earnings had increased \$937,758.93, or about 4.5 per cent. over the preceding fiscal year, the increase applying to all classes of traffic. The average revenue tonnage per train per mile was 507.2 an increase of 4.4 tons, while the average distance each ton was carried was 81.10 miles, a decrease of .58. The total payments, including renewals and improvements, equipment depreciation fund, interest on funded debt and guarantees, miscellaneous interest, rentals of leased lines, and taxes, amounted to \$8,514,252.54 leaving a surplus of \$2,334,720.05, of which \$2,193,704 was paid in dividends to stockholders and \$141,016.05 transferred to credit of profit and loss.

The train mileage of passengers was 3,611,656, of freight 3,462,153—total, 7,073,809 miles; 17,386,249 passengers were carried, of which 221,774,098 were carried one mile at an average mile rate of 1.479 cents; 21,313,977 tons of freight were moved, of which 1,740,945,731 tons were carried one mile at an average ton-mile rate of 0.845 cent.

Of the \$30,000,000 authorized capital stock of the company there was outstanding in 1905 \$27,425,800, there having been issued during the fiscal year \$7,000 for redemption of an equal amount of convertible debenture bonds. The total funded indebtedness of the company at the close of the fiscal year ended 30 June 1905, amounted to \$50,361,000 as against \$51,317,100 at the end of the preceding year, a decrease of \$956,100.

Central University, a co-educational institution in Pella, Iowa, organized in 1853, under the auspices of the Baptist Church; reported at the end of 1901: professors and instructors, 15; students, 83; volumes in the library, 5,000; grounds and buildings valued at \$60,000; productive funds, \$24,000; benefactions, \$1,500; income, \$5,350.

Central University of Kentucky, a co-educational institution at Danville, Ky., under the auspices of the Presbyterian Church. It was given its present organization in June, 1901, by the consolidation of the Centre College of Danville (founded 1822) and the Central University of Richmond (founded 1874). Number of instructors reported, 107; number of students, 1,205; volumes in the library, 25,000; total value of property, \$1,500,000.

Central Vermont Railway Company. This company was chartered in 1898 under authority of Paragraph No. 6, Act No. 159 of the Laws of the State of Vermont, and was formed for the purpose of acquiring title to, owning and operating the railroads of the Central Vermont Railroad Company, in pursuance of a plan for the reorganization of that company issued 29 Sept. 1898. The property was sold under foreclosure 21 March 1899, and the Central Vermont Railway Company came into possession 1 May 1899.

Funded Debt.—The funded debt consists of first mortgage 4 per cent 20 year gold bonds due 1 May 1920, interest payable February, May, August and November. The amount authorized by the mortgage is

\$12,000,000, but there are only \$11,000,000—\$1,000,000 being reserved in the hands of the trustee to be issued for betterments and improvements under proper restrictions. The bonds are secured on the entire property and assets of the company.

Also Montreal & Province Line first mortgage 4 per cent gold bond \$200,000—dated 1 Oct. 1900, interest payable semi-annually in April and October. The mortgage is a first lien upon the Montreal & Province Line Ry., 40.6 miles in length, extending from Saint Lambert to Farnham, P. Q., 32 miles, and Marieville, P. Q., to Saint Cesaire, P. Q., 8.6 miles. The Central Vermont Railway Company owns the entire capital stock of the M. & P. L. Ry. Co.

Car Trust Notes.—Under date of 1 March 1905, the Central Vermont Railway Company issued \$620,000—car trust notes, in favor of Messrs. Blair & Company, in part payment for 1,000 new box cars, and 10 new passenger cars. These notes, 620 in number, for \$1,000 each, are payable according to the terms of the notes in 40 consecutively quarterly instalments on the 1st days of March, June, September and December of each year, commencing 1 June 1905, and ending 1 March 1915. The amounts so payable on the 1st days of June and December are \$15,000—and on the 1st days of March and September \$16,000. That is to say, there shall be retired 62 notes each year. These notes bear interest at the rate of 4½ per cent per annum, payable quarterly on the 1st days of March, June, September and December of each year.

Mileage.—The company owns and operates the following lines: Between Windsor, Vt., and Saint Johns, P. Q., 177.5 miles; between Montpelier Junction and Williamstown, Vt., 14.9 miles; between Essex Junction and Burlington, Vt., 8 miles; between Essex Junction and Cambridge Junction, Vt., 26 miles; between St. Albans and Richford, Vt., 28 miles; between Swanton Junction, Vt., and Rouses Point, N. Y., 17.7 miles; between S. S. & C. Junction, P. Q., and Waterloo, P. Q., 40.8 miles; between Saint Lambert, P. Q., and Frelighsburg, P. Q., 50 miles; and between Marieville, P. Q., and Saint Cesaire, P. Q., 8.6 miles; a total of 371.5 miles.

The Central Vermont Railway Company leases the New London Northern Railroad, extending from New London, Conn., to Brattleboro, Vt., 121 miles; from Montville, Conn., to Palmerton, Conn., 2.5 miles; also the West River Railroad, extending from Brattleboro, Vt., to South Londonderry, Vt., 36 miles, a total of 159.5 miles, at an annual rental of \$213,652.20, payable monthly.

Equipment.—On 30 June 1905, the rolling stock consisted of the following: Locomotives—passenger 29, freight 64, and switching 5, a total of 98; passenger cars—coaches 67, combination cars 28, baggage, mail and express 20, parlor-cafe cars 2, pay car 1, and official 1, a total of 119; freight cars—box, 1,914, flat 609, stock 21, refrigerator 17, hay 6, butter 5, coal 283, for other uses 67, a total of 2,922; and 49 cabooses. The road and equipment, up to 30 June 1905, represented an outlay of \$13,839,510.92.

CENTRAL WESLEYAN COLLEGE — CENTRE OF BUOYANCY

Traffic, Earnings, Etc.—For the year ending 30 June 1905 there were 3,149,416 tons of freight carried or 267,815,068 tons carried one mile, showing a gross earning of \$2,366,211.60 or \$.0088 per ton per mile. For the same period the number of passengers carried was 1,601,430, or 42,393,798 carried one mile, showing gross earnings of \$1,127,501.94, an average of \$.0229 per passenger per mile. The passenger receipts include the mail and express receipts of \$156,777.19. The total receipts amounted to \$3,557,775.71 and the operating expenses to \$2,793,736.51.

G. C. JONES,
General Manager.

Central Wesleyan College, a co-educational institution in Warrenton, Mo., organized in 1864, under the auspices of the Methodist Episcopal Church; reported at the end of 1902: professors and instructors, 18; students, 294; volumes in the library, 7,000; grounds and buildings valued at \$100,000; productive funds, \$70,000; income, \$10,300.

Centralia, Ill., a city in Marion County; on the Illinois Central, Southern, Chicago, B. & Q., and the Illinois Southern R.R.'s; 60 miles east of Saint Louis and 252 miles southwest of Chicago. It is situated in the famous fruit-belt of southern Illinois and carries on an extensive fruit trade. The Illinois Central machine shops, employing 400 men, are located here, there are three coal mines, employing 700 men, window glass works with 200 employes, and the city carries on many minor industries, such as the manufacture of flour, envelopes, rails, fruit-boxes, knit goods, iron and steel, etc. There are two banks capitalized at \$130,000. Religious services are held in 10 church edifices and for educational purposes there are an excellent high school and graded public schools, supplemented by a Carnegie Library. Centralia was first settled in 1853, and became a city in 1854, the affairs of the community now being administered by a mayor and council of 10 members elected every two years. The city owns the waterworks. Pop. (1890) 4,763; (1900) 6,721.

C. D. TUFTS,
Editor 'Democrat.'

Centralia, Wash., city in Lewis County, on the Northern Pacific R.R. The chief resources of the city are derived from the lumber industry and from farm and dairy products. There are two banks with a combined capital of \$60,000, several public schools, with an enrollment of 1,145 pupils, and many handsome church edifices. Centralia was first settled in 1857 by James Cochran, became a borough in 1873, and a city in 1890. The present form of government is by a mayor and council of seven members. The mayor is elected annually and the councilmen biennially. Pop. (1890) 2,026; (1900) 1,600; (1905) 4,000.

Centralists, one of the prominent political parties of Mexico, organized in 1823 and re-organized in 1837, and of which Santa Anna was long the leading spirit. The Centralists, or reactionaries, favored a single centralized form of government, whereas the Federalists, or States Rights Party, favored autonomy of the States. To the keen rivalry of these two political parties may be attributed the state of civil war and revolution which for so long a time was prevalent in Mexico. See MEXICO, *History*.

Centraliza'tion, the placing in the hands of a central government jurisdiction over matters which might be under the management of local authorities. The term is used to denote the increase of power of a central authority already established, or the closer union under a central power of a confederation of partially independent States. The adoption of the Constitution of the United States was centralization in the latter sense. The question of centralization in the first sense has been an important one in United States history, forming the point of dispute between the first two political parties, and being a frequent subject of discussion at all times. The question as applied to the United States is whether to interpret the Constitution liberally, and give the national government power in doubtful cases; or whether to put a close construction on the Constitution and give the States the benefit of the doubt.

Centrarchidæ, sĕn-trär'kĭ-dĕ, a family of fresh-water percoid fishes, confined to North America. The body is generally short, deep, and compressed, with an equal curvature above and below, and covered with rather large, strong ctenoid scales. The mouth is terminal, variable in size, with the premaxillary protractile, and numerous fine, close teeth on all of its bounding bones. Both dorsal and anal fins are long, with 6 to 13 strong, sharp spines in the anterior part of the former, and 3 to 8 in the latter. All are active, pugnacious, carnivorous fishes, many of which build nests. They are important game and food fishes of small or moderate size, of which about 12 genera and 30 species are known, almost all of which are confined to the Mississippi valley and the eastern United States, where they are almost the most characteristic fishes. The most important are the grass bass, black bass, rock bass, warmouth, and sunfishes (q.v.)

Centre-board, a contrivance used in a yacht or shallow, keelless, or flat-bottomed vessel, to counteract the tendency to make leeway and to enable the craft to stand up under press of sail. It consists generally of a quadrangular wooden or iron plate which is bolted or hinged by its lower forward corner into a trunk or casing which fits, water-tight, over a fore-and-aft slot in the vessel's bottom, about midway of her length. When running before the wind or in shallow waters the centre-board is hauled up inside the trunk. When on a wind, or with the wind abeam, the centre-board is lowered, presenting a broad surface to the water on the same principle as a lee-board (q.v.). The term centre-board is essentially American; elsewhere the contrivance is known as a sliding-keel. See YACHT AND YACHTING.

Centre of Buoyancy. The pressures which act on every point of a surface immersed in a fluid can be resolved into horizontal and vertical components. The former balance each other. The resultant pressure must therefore be vertical; and, as the pressure increases with the depth, it is clear that the upward pressures must be greater than the downward. Hence the resultant pressure on an immersed body must be a force acting vertically upward. It is easily shown that the magnitude of this pressure is equal to the weight of the fluid displaced. The

CENTRE COLLEGE — CEO

point in the displaced fluid at which the resultant vertical pressure may be supposed to act is called the centre of buoyancy, or centre of displacement. Hence, we see that when a body floats in a fluid it is kept at rest by two forces, the weight of the body acting downward through its centre of gravity, and the weight of the fluid acting vertically upward through its centre of gravity or centre of buoyancy. The relative positions of the centre of gravity and the centre of buoyancy have an important bearing on the safety of ships at sea. If the centre of buoyancy be above the centre of gravity, the equilibrium is stable; in other words, if the ship is displaced, it will tend to return to its original position. If, on the other hand, the centre of buoyancy be below the centre of gravity, the equilibrium will generally be unstable, although a body may float in stable equilibrium even if the centre of buoyancy be below the centre of gravity.

Centre College, Danville, Ky. See CENTRAL UNIVERSITY OF KENTUCKY.

Centre of Gravity, or **Centre of Inertia**, a point in a body, or in a system of bodies, which in modern works on mechanics is usually and preferably called the "centre of mass." See MASS.

Centre of Gyration. See PENDULUM.

Centre of Inertia. See CENTRE OF GRAVITY.

Centre of Oscillation. See PENDULUM.

Centre of Percussion. See PENDULUM.

Centre of Population, the centre of gravity of the population of a country, each individual being assumed to have the same weight. The centre of population in the United States has clung to the parallel of 39° lat. and has moved in a westward direction during the last 110 years. The following table shows the movement of the centre of population since 1790:

Years Census	North Latitude	West Longitude
1790	39° 16.5'	76° 11.2'
1800	39 16.1	76 56.5
1810	39 11.5	77 37.2
1820	39 5.7	78 33.0
1830	38 57.9	79 16.9
1840	39 2.0	80 18.0
1850	38 59.0	81 19.0
1860	39 0.4	82 48.8
1870	39 12.0	83 35.7
1880	39 4.1	84 39.7
1890	39 11.9	85 32.9
1900	39 9'36"	85 48'54"

Centre of Pressure. See HYDROSTATICS.

Centreing, or **Centering**, the framing of timber by which the arch of a bridge or other arched structure is supported during its erection. See BRIDGE.

Centrifugal Force, a phrase popularly used to express the tendency manifested by a body revolving about a centre to fly away.

Centrifugal Machines, machines used for various purposes, in which centrifugal force produced by rapid revolution is utilized. Such a machine may be used for drying clothes or other goods, the articles being placed inside a hollow cylinder made of wire-gauze or with numerous perforations in its circumference,

which, being driven at a high speed, the moisture is caused to fly off by centrifugal action. Sugar is now often separated from the molasses by a centrifugal machine, the product being commonly known by the trade name of "centrifugal sugar." The cylinder in which the sugar is contained is placed within a larger cylinder in which the molasses is received. Liquids such as beer, can also be clarified and cleared of foreign substances by means of centrifugal action, the extraneous matters being made to collect at the circumference of the vessel through the high rate of speed at which it is driven, while the clear liquid can be drawn off by an outlet at the centre. Cream is now commonly separated from milk in large dairies by the same method. See BUTTER.

Centripetal Force, a force which tends continually toward a given fixed point, or centre; a "central" force. See DYNAMICS; ENERGY, CONSERVATION OF.

Centumviri, judges of ancient Rome, three from each tribe, who determined ordinary causes. The extent of their jurisdiction is uncertain. Hollweg would confine it to civil cases; it seems probable that they at first handled questions relating to quiritarian ownership, which determined the status of the citizens.

Centuries of Magdeburg, a history of the early Christian Church, so called because it was divided into centuries, each of the 13 volumes containing a hundred years, and was first written at Magdeburg. Matthias Flacius formed the plan of it in 1552, but the last volume did not appear until 1574. It is the first comprehensive work of the Protestants on Church history; its main purpose was to prove the agreement of the Lutheran doctrine with that of the primitive Christians, and the difference between the latter and that of the Roman Catholics.

Centu'ron, a Roman army officer who commanded a century, or body of 100 men. The rank of a centurion corresponded very nearly to that of a captain in modern armies. See LEGION.

Centuripe, chēn-too-rē'pā, Sicily, a town in the province of Catania, situated on a height above the valley of the Simeto, 20 miles northwest of Catania. It is situated in a district yielding soda, sulphur, and marble. The ancient city (Centuripa), considerable ruins of which exist, was at one time among the important cities of Sicily. Pop. 11,000.

Cent'ury, in chronology, a period of 100 years. Modern chronology of Christian nations centres at the birth of Christ, and the centuries are numbered according to their order either before or after that event, for example, the 20th century A.D., the 4th century B.C.

In Roman times, (1) a division of 100 men in the army, corresponding to the modern company, 60 of which formed a legion; (2) a division of the six classes of the people, introduced by Servius Tullius, for the purposes of taxation and voting.

Century-plant, a popular name of the *Agave americana*, or American aloe. See AGAVE.

Ceo, **Violante do**, vē-ō-lān'tā dō thā'ō. Portuguese poet: b. Lisbon 1601; d. 1693. She was styled "the tenth Muse." Her Portuguese

CEORL — CEPHALONIA

Parnassus' and miscellaneous poems are greatly admired.

Ceorl, chér'l. See CHURL.

Ceos, sē'ōs, or **Kea**, kā'ä (sometimes called by the Italianized name of *Zea* or *Tzia*), an island in the group of the Cyclades, in the Ægean Sea, 13 miles off the coast of Attica. It is 13 miles long, 8 broad and 39 square miles in area. The central and culminating point is Mount Elias, 1,863 feet high. It is fairly fertile, raising fruit, wine, honey, and valonia. In ancient times Ceos was noted as the birthplace of the poets Simonides and Bacchylides, and the physician Erasistratus; and the Cean laws were famous for their excellence. The capital is Ceos.

Cephaelis, sĕf-ā-ē'līs, a genus of plants belonging to the order *Rubiaceæ*, natives of tropical America. The roots of *C. ipecacuanha* furnish the commercial drug of that name. See IPECAC.

Cephalaspis, sĕf-ā-l-ās'pīs, a genus of ostracoderms (q.v.) of the Devonian Period, characterized by a semicircular or semioval head-shield, with spines at the angles. It has a curious superficial resemblance to the head-shields of certain trilobites.

Cephalization, sĕf-a-lī-zā'shŭn, a principle advanced by Dana, who claims that cephalization is simply domination of the head—cephalic domination—in an animal, as manifested in the structure; and any degree of it depends on the grade or power of the cephalic centre and the degree of subordination to it in the structure. He agrees that since animals have a head as their grand characteristic feature, and a brain as the fundamental element of the head and the prime centre of force in the organism, exaltation and concentration anteriorly of the life-forces mark a high grade of cephalization. Their concentration of parts anteriorly, with exaltation of the cephalic end of the body, is manifested not merely in the transfer of members to the cephalic series, but also in the form and structure of the head, of the sense-organs, the mouth-appendages, the legs and abdominal appendages.

The principle is most clearly shown by the increased size and specialization of the head of the crab and the corresponding reduction of the abdomen as compared with the elongated abdomen of the lobster and shrimps, as well as the relations of the head to the thoracic and abdominal regions in the amphipod and isopod *Crustacea*. It should be observed that in arthropods in general, at the beginning of embryonic life, development begins with the head, thus in *Limulus*, *Arachnida*, *Crustacea*, and insects, the head is the first to become developed; its segments and appendages arise before those of the hind body. It is so in the vertebrates, the head at first forming the bulk of the body. This is the case with annelid worms, etc., in their larva, the trochosphere (q.v.), the bulk of the body is formed by the head. It is not improbable that the cause of the large size of the head in the embryos of all the higher animals is in some way connected with the fact that development begins at the anterior end. On the other hand the new segments later in embryonic life in worms and arthropods arise at the growing-

zone, which is situated at the end of the hind body, between the penultimate and terminal segments of the body.

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Cephalochorda, sĕf''ā-lō-kōr'dā, a group of *Chordata* (q.v.) represented by the lancelet or *Amphioxus* (q.v.). Other names for the young group are *Leptocardii* and *Acrania*. The *Cephalochorda* are fish-like in shape, and have a notochord extending the length of the body, beginning in the head; hence the name *Cephalochorda*. The notochord is situated between the nervous system and the digestive canal. The central nervous system lies entirely on one side of the digestive canal, while numerous gill-slits extend from the pharynx to the exterior.

Cephalodiscus, sĕf-ā-lō-dīs'kŭs, a very puzzling animal now placed in the subphylum *Enteropneusta* (*Hemichordia*), along with *Balanoglossus* (q.v.). It is a deep-sea form, and at first was mistaken for a large polyzoan, which it strikingly resembles. It is like *Balanoglossus* in being divided into three regions, that is, a proboscis, a collar, and the main trunk, which is very short; but it is not worm-like in general appearance. Its place among the chordates is due to the presence of a structure resembling a notochord, with the same relations to the nervous system as in *Balanoglossus*. It differs however, from the latter animal in the possessing tentacles arising from the collar, and in the digestive canal being bent on itself as in the *Polyzoa*, so that the vent is situated near the mouth; and it has only a single pair of openings supposed to represent the gill-slits. These creatures occur in colonies, secreting a common branching case somewhat like that of *Polyzoa*, and it multiplies by budding.

Cephalonia, sĕf-ā-lō'nī-ā, or **Kephallenia**, an island of Greece, the largest of the Ionian islands, northwest of the Morea, at the entrance of the Gulf of Patras, about 31 miles in length, and from 5 to 12 in breadth; area, 302 square miles. The coastline is very irregular and deeply marked with indentations, and the surface is rugged and mountainous, rising in Monte Negro, the ancient Ænos, to a height of 5,380 feet. There is rather a deficiency of water on the island. The principal towns are Argostoli, the capital, and Lixuri. The chief exports are currants, oil, and grain; wine, cheese, etc., are also exported. The manufactures are inconsiderable, consisting of some cottons, carpets of mixed wool and goats'-hair, with some potteries and distilleries of liqueurs. The island is subject to frequent earthquakes. One of the most destructive was that of the year 1867. The greater part of the population are of the Greek Church; the others belong to the Catholic Church. By Homer the island was called Same or Samos, though he speaks of the inhabitants as Cephalenes. The island adhered to Athens during the Peloponnesian war. In 189 B.C. it came under the Roman dominion and after the division of the empire, it became subject to the Byzantines. In the 12th century it was taken by the Normans, and afterward fell successively into the hands of the Venetians and Turks, and then again into the hands of the Venetians, who retained possession of it until 1797, when the French seized it. From 1815 it belonged to the Republic of the United Ionian Islands, and in

CEPHALOPODA — CERACCHI

1864 was united with the other islands to the kingdom of Greece. With Ithaca and a few other adjacent islands it forms a nomos or province of the kingdom of Greece. Pop. of nomos 83,363; of the island about 72,800.

Cephalop'oda, a class of mollusks represented by the squid, cuttle-fish, octopus, nautilus, argonauts, etc. In these mollusks the head-lobe bears arms or tentacles, as the animal has no "foot" or creeping-disk like that of other mollusks, though its homologue is found in the siphon and tentacles. They have an unpaired muscular mantle, which forms the walls or outside, so that as in the squids, where there is no outer shell, the body is naked. The nervous system is much concentrated, for not only are the cerebral ganglia, pedal, and visceral ganglia in the head, but also the ears and osphradia, or olfactory organs. The large complicated brain, thus composed of the three primary pairs of ganglia with some accessory ones, are enclosed in a cephalic cartilage which suggests a comparison with the cartilaginous skull of the lamprey and sharks. In the body behind are the sympathetic and stellate ganglia. The eyes as a rule are highly developed, with a retina, choroid, iris, cornea, vitreous body, and lens. The gills are well developed, either as one or two pairs situated within the mantle-cavity. The water is forced from the mantle-cavity, which is open behind the head, through the siphon. There are two kinds of hearts. The systematic heart consists of two or four (nautilus) auricles receiving the blood from the gills, and a median ventricle from which arise the anterior and posterior aortæ. There is also, at the base of each gill, a branchial heart, which receives the blood from the vena cava and pumps it into the gill. These branchial hearts are not known to exist in other mollusks, and no other mollusks possess an ink-sac. The armature of the mouth, however, as in gastropods, consists of two horny teeth, enormous in most cephalopods, and an odontophore with its lingual ribbon for cutting flesh, etc. The eggs in developing undergo a superficial or discoidal development; and the young undergo no metamorphosis. The shell of cephalopods is either chambered, as in orthoceratites, nautiloids, and ammonoids, or, as in argonauts, forms a simple deep basin. In the squids and cuttle-fish the body is supported by an internal pen or "bone."

The cephalopods are divided into two orders, according to the number of their gills.

Order 1. *Tetrabranchiata*.—This group, in which the gills are four in number, is represented by the nautilus, the sole living representative of a number of fossil forms, such as *Orthoceras*, *Goniatites* and *Ammonites*. *Nautilus pompilius* and *Nautilus umbilicatus* are the only survivors of about 1,500 extinct species of the order. See NAUTILUS.

Order 2. *Dibranchiata*.—The dibranchiates are so called from possessing but two gills, while the tetrabranchiates had, as in *Nautilus*, numerous unarmed tentacles; these are now represented by 10 (*Decapoda*) or 8 (*Octopoda*) arms, provided with numerous suckers. To the 10-armed forms belong *Spirula*, a diminutive cuttle with an internal coiled shell. The shells of *Spirula peronii* are rarely thrown ashore on Nantucket; it lives upon the high seas. The extinct Belemnites had, like the recent *Moroteuthis*,

a straight conical shell, the "thunderbolt" fossil. Allied to *Loligo* and *Ommastrephes* are gigantic cuttle-fishes which live in mid-ocean, but whose remains have been found at sea or cast ashore on Newfoundland and the Danish coast. Their jaws also occur in the stomachs of sperm whales.

Fossil Cephalopods.—The greater proportion of cephalopod mollusks are fossil. They began to exist in the Cambrian Period, and, as nautiloids and ammonoids, flourished in great profusion in the Palæozoic and Mesozoic eras, the ammonites (q.v.) of the Jurassic and Cretaceous beds numbering about 5,000 species.

Cephalula, sěf-ā-loo'la, the name applied by Packard to the stage of the embryos of mollusks and of worms immediately succeeding the gastrula (also the trochosphere) when the larva is still a surface-swimmer and the head is beginning to be formed. Consult Packard 'Life-Histories of Animals,' p. 94.

Cephalus, sěf-ā-lūs, the son of Creusa; according to some the son of Deion, king of Phocis, and of Diomedes. He was the husband of Procris, or Procene. Shortly after his marriage Eōs (Aurora) carried off the beautiful youth while he was hunting on Mount Hymettus. He refused the love of the goddess, who induced him to put the virtue of his wife to a trial which it could not withstand. Procris, in return, tempted him likewise, and he yielded also. Learning their mutual weakness, they became reconciled. 'But Procris subsequently became jealous of her husband, and concealed herself in a wood to watch him. He mistook her among the leaves for a wild animal, and killed her with a javelin.

Cephas, sě'fas, a surname given by Christ to Simon. In the Greek it is πέτρος ("a rock"), in Latin *Petrus*, and in English Peter.

Cepheus, sě'fūs, a king of Ethiopia and husband of Cassiopeia; his name was given to a constellation of stars in the northern hemisphere, surrounded by Cassiopeia, Ursa Major, Draco, and Cygnus. See CASSIOPEIA.

Cephis'sus, the name of three rivers of Greece. (1) A river which waters the Athenian plain. It rises on the west slope of Mount Pentelicus and the south side of Mount Parnes, and flows past Athens on the west into the Saronic Gulf near Phalerum. (2) A river of Attica emptying into the Gulf of Eleusis. (3) A river flowing through eastern Phocis and northern Bœotia and emptying into Lake Copais (Topolias).

Ceracchi, Giuseppe, joo-sěp'pě chā-rā'kē, Corsican sculptor: b. on the island of Corsica, 4 July 1751, or, according to others, about 1760; d. Paris 29 Jan. 1801. In 1798 he took part in establishing the republic at Rome, of which he was among the warmest partisans. On the re-establishment of the papal authority he was obliged to leave Rome, and went to Paris, where he was employed in making a bust of the First Consul. Nevertheless, he joined the young French artists whom he had known at Rome, and whose ardent republican opinions coincided with his own, in a conspiracy against Bonaparte, in whom he saw only the oppressor of his country. On 9 Nov. 1800, he was arrested at the opera, with Arena, Damerville, and Topino Lebrun. Before the tribunal he answered only in

CERAM — CERAMICS

monosyllables to the questions put to him. He was sentenced to death, together with his accomplices, and ascended the scaffold with great firmness. The death of this disciple, and almost rival, of Canova, was a great loss to sculpture.

Ceram, sě-rām', or **Ceiram**, called by the natives Zeram or Serang, an island of the Moluccas, the second of the group in size, lying west of New Guinea; in the Indian Archipelago; area about 7,000 square miles. Its interior is very imperfectly known, but it is understood to be traversed by mountain ranges from 6,000 to 8,000 feet high, and culminating in Noosaheli, which is 9,250 feet. The vegetation is luxuriant and gigantic, some of the sago-palms growing 100 feet high. Sago forms the chief food of the inhabitants and is an article of trade. The inhabitants of the coast are of Malay origin, and have extensive fisheries. The interior is peopled by Alfoories or Alfuros, long known for their barbarous custom of using human skulls for public and private ornament, and the still more barbarous atrocity of committing murder in order to procure them. They are said to have become more civilized, and many of their rajahs have adopted the European dress and manners. They are divided into various independent tribes. Christianity has been introduced into several villages on the south coast, but not with any great success, though it is said that in some of the villages a considerable number of those professing Christianity can now read and write. The island belongs to the Dutch, who have established several stations there under the charge of an official residing at Wahai on the north coast. Pop. estimated at 195,000.

Cerambycidæ, sě-rām-bis'ĩ-dē, a family of beetles of great extent, readily known by their very long antennæ, which give its members the name of "longicorns." The family already numbers some 12,000 or 13,000 species, though probably not over half of the existing forms are known. It comprises some of the largest, most showy, as well as the most destructive insects of the sub-order. They are readily recognized by their oblong, often cylindrical bodies, the remarkably long, filiform, recurved antennæ, and the powerful incurved mandibles. Their eggs are introduced into cracks in the bark of plants by the long, fleshy, extensile tip of the abdomen. The larvæ are long, flattened, cylindrical, fleshy, often footless, whitish grubs, with very convex rings, the prothoracic segment being much larger and broader than the succeeding, while the head is small and armed with strong, sharp mandibles adapted for boring like an auger in the hardest woods. These borers live from one to three years before transforming, at the end of which time they construct a cocoon of chips at the end of their burrows, the head of the pupa lying next to the thin portion of bark left to conceal the hole.

The species of the American genus *Oncideres* are called girdlers, because the parent beetle, after laying an egg in a small branch, girdles this round with a deep incision, so that the portion containing the larva sooner or later falls to the ground. The growth of a longicorn larva frequently takes more than a year, and under certain circumstances it may be enormously prolonged. *Monohammus confusus* has been known to issue from wooden furniture which was 15 years old. Individuals of another longi-

corn have issued from the wood of a table 20 and even 28 years after the felling of the tree from which it was made. Watson has related a case from which it appears probable that the life of a longicorn beetle dwelling in household furniture extended over at least 45 years. It is generally assumed that the prolongation of life in these cases is due to the beetle resting quiescent long after it has completed the metamorphosis; but more probably it is the larval life that is prolonged; the larva continuing to feed, but gaining little or no nutriment from the dry wood in these unnatural conditions. A large number of longicorns stridulate loudly by rubbing a ridge inside the pronotum on a striate surface at the base of the scutellum. A few produce noise by rubbing the hind femora against the edges of the elytra, somewhat after the fashion of grasshoppers; and some possess highly developed stridulating surfaces on the hind and middle coxæ.

Ceramics. The operations of the clay worker rank among the most ancient of those undertaken by man and are, with the single exception of agriculture, the most widely spread. The origin of the art is lost, but it is quite certain that in prehistoric times the plasticity of clay had been remarked and made use of. The first clay work probably consisted of brick, and these were at first sun dried. (See BRICK.) Of sun-dried pottery but few examples remain, and the fact that such wares could not be employed to hold liquid prevented a very extensive use of unburned pieces. The knowledge that clay could be hardened and made impervious by burning must be ranked as a discovery distinct from that of shaping the plastic clay. It is not unlikely that the funeral pyre revealed the secret. Vases and jars have been found in the British barrows or tumuli which have apparently been burned only in the fire by which the body was consumed.

Clay work was originally formed by hand alone, the method followed being similar to that still practised by certain tribes of Indians. A plastic clay was worked and kneaded to render it homogeneous and was then rolled into long thin strips. These were coiled in a spiral form and the joints made good by pressure until the desired size and shape was reached. The invention of the potters' wheel marks an epoch in the history of the art and wherever the wheel became known it entirely superseded the older method. Some peoples, however, never learned of the wheel, but brought their own craft to great perfection. The wheel is of very ancient date. Dr. Birch ('Ancient Pottery') states that the Egyptians attributed it to the power of the gods. Num, the creator, used it for the formation of the human race. (See POTTERS' WHEEL.)

In modern times the wheel has given way to the mold as a means of giving shape. (See POTTERY.)

Among early workers natural clay was used and their wares are colored, the single exception being Chinese porcelain. (See PORCELAIN.) The first traces of pottery are found in Egyptian hieroglyphics, where vases, evidently wheel-made, are depicted in the writing. The vases themselves of various dates are to be found in museums and the recent excavations by Dr. Flinders Petrie have added much to our know-

CERAMICS

ledge of Egyptian work. In Babylonia and Assyria the main interest lies in the fact that clay was used as a means of writing. Clay tablets and cylinders were prepared and with angular punches the cuneiform characters were impressed. The tablet being fired the writing became indelible. Vast stores of these clay records have been discovered and are being deciphered.

In Greece the fictile art was developed in a remarkable degree. A high standard of criticism prevailed and the arts reached great perfection. Greek pottery ranges from 700 to 200 B.C. The early work was crude, almost barbaric. The clay was of a pale salmon tint deepening to a warm brown. Upon the polished surface decorative patterns were traced in black. Geometric designs occupied the attention of one section, others attempted a more florid treatment developing into silhouettes of birds and animals. The human figure eventually prevailed and scenes from mythology and local history appeared. The great change came when, instead of black figures on a red background, the figures were outlined and the background painted in black. This enabled details of feature and drapery to be executed with rare fidelity, and the culminating point of Greek pottery was reached. There are some 15,000 Greek vases in existence and the larger number of them are of superior workmanship.

The pottery of the Romans exists in great abundance, but few pieces are remarkable for excellence of workmanship. The Romans possessed an abundance of glass and the rude pottery of the household was displaced at the table of the patrician. Roman pottery is remarkable for its wide distribution. Their armies seem to have been regularly accompanied by potters. Germany, France, and Great Britain are covered with fragments of Roman wares made for the most part from local clay. A remarkable variety of pottery is that known as Samian, or more correctly, as Aretine ware. This is made of clay of a brilliant red color, and as molds and waste pieces have been found in England and France the presumption is that the clay as well as the workman was imported. No such clay is known to exist now and the wares are all made of the same material. The Roman "slip painted" or Castor ware was the ancestor, though after a long interval, of the English clay decorated pieces which gave the potter's art so firm a hold on the English people and eventually brought the knowledge of clay working to the American colonists.

In the far East a different line was being wrought out. The pottery of India and Persia was the descendant of Egyptian blue-glazed ware. The characteristic which distinguishes these wares from the productions of Greece and Rome is the glaze. Very early in the history of the art it was found necessary to use some impervious coating before the pottery could be extensively used, but in the East a covering of glaze was used for its decorative effect. This fact led to an important development. A glaze upon brown or red clay is not always pleasing, and therefore the expedient was adopted of coating the clay with a light-colored slip or engobe. Thus Oriental engobe ware has become a recognized type of ceramic production. Each Eastern nation in turn worked on similar lines. India affected colored glazes well known in the rich

blue roofing tiles of Multan. Persia adopted a delicate fanciful tracery of floral motif, the outlines being filled in with light blue and gray. A beautiful pottery, almost porcelain, was made in Persia and exported from the port of Gombroon, hence known as Gombroon ware. The characteristic feature was a series of fine perforations which were filled with glaze, producing a transparent pattern upon a slightly translucent ground.

Damascus produced many fine pieces of engobe ware, the treatment being more forceful than that of Persia. In the island of Rhodes and in certain neighboring localities variety was given by the adoption of red in the decoration. This red consisted of a natural earth. The development of the peculiar colors found on this ware is due to the absence of lead oxide from the glaze. (See GLAZE.) The Arabians and Moors carried the knowledge of pottery along the north coast of Africa, and when, in the 8th century, the former people invaded Spain they brought the art with them. It was not, however, until the Moorish invasion in the 12th century, and the building of the Alhambra palace, that any great progress was made. A notable change took place in the introduction of tin oxide as a glaze constituent. The knowledge of this substance existed farther east, but in Spain both tin and lead were found in abundance. The consequence was that the intermediate coating or engobe was discarded and the glaze itself rendered opaque by tin oxide. This of course involved a different treatment of color and as the art spread from Spain to Italy the great schools of Italian Majolica grew up. (See MAJOLICA.) In France some variations took place and in Germany the main product was stoneware (q.v.).

In England the ceramic art had never been forgotten. The departure of the Romans had caused a relapse and neither Anglo-Saxon nor Norman pottery was of any importance. About the Tudor period, however, a revival took place. The potters had foregathered in Staffordshire, where there was an abundance of clay, and there they produced the slip decorated, the combed, marbled, and tortoise-shell wares which are so characteristic of the time. A great stimulus was given by the arrival of two Dutchmen named Glers. These brothers were skilful potters and speedily influenced the quality of the claywares manufactured. They, in fact, prepared the way for Josiah Wedgwood, who established the English factory system and made it possible for skilled men to combine their efforts in the production of fine pottery. See WEDGWOOD.

In America the history of the ceramic art may be conveniently, if somewhat arbitrarily, divided into four epochs. (1) The work of the aborigines. (2) From Colonial times until 1840. (3) From 1840 to 1880. (4) The present day.

The work of the natives was varied and interesting. The wheel seems never to have been used; but, on the other hand, the process of building pottery by means of coils of clay was brought to great perfection. Barber ('Pottery and Porcelain of United States') divides pre-Columbian pottery into three groups, (1) the crude work of the eastern coast; (2) the better wares of the mound builders, and (3) the superior productions of the more civilized tribes of the west.

CERAMICS

The eastern tribes were scarcely more than savages, even in the day of the Pilgrims. The pottery was rude in the extreme and scarcely burned. So fragile indeed that but few examples remain. The Wyoming Historical and Geological Society of Wilkesbarre, Wyoming County, Pa., have given attention to the preservation of these records, and they possess some unique specimens. Clay pipes were in common use among the Indians, and, in fact, were put in circulation as a kind of currency. Some of the Indian women even now in their reservations indulge in the pastime of pottery-making, but the manufacture has almost died out.

The pottery of the mound-builders forms an extensive study in itself. In addition to the building of plain forms considerable skill in modeling was developed. Not only were animal and bird forms produced, with more or less fidelity, but the human face, in some cases full of expression, was constantly used as a relief embellishment. Students distinguish between painted and unpainted wares, but there is divided opinion as to whether these classes were contemporaneous or divided.

Through the States of Colorado and Utah, and in the great valleys of the San Juan, the Colorado and the Rio Grande, are found numerous relics of the work of the house-building tribes. This pottery is far in advance of either of the other types. In some cases the structure of the soils is boldly asserted as a decoration, sometimes alone and often in conjunction with painting. Skill in modeling was well developed, but the work is archaic in type. Drawings of birds and beasts are frequently used in decoration and natural clays find frequent employment as colors. There is no doubt that the principles of decoration by which the contemporary basket work was embellished inspired much of the clay treatment.

Even the earliest settlers engaged more or less in clay work. Brick and tile were, naturally, their first products. See BRICK; ROOFING TILE.

The first pottery for white or cream wares was built at Burlington, N. J., about the year 1684. The abundant clays of New Jersey attracted the attention of many who had been concerned with pottery in the old country, and for nearly two hundred years the work was in close imitation of that manufactured in England. Nearly all the distinctive styles of the period were attempted. Slip painting, sgraffito, stoneware, and queensware were all pursued with more or less success, both English and German potters being at work. In some parts of the country, notably in eastern Ohio, pottery-making became a home industry. Many a barn held a "kick" wheel, and a small kiln served to finish the work. Farmers divided their time between clay and soil; and, building rough flat-boats, would float their wares down the river for sale in the large towns.

The third epoch may be described as that of the factory. The large pottery centres, East Liverpool, Ohio, and Trenton, N. J., were established about the beginning of the period. It may also be characterized as the era of bad quality. The potters were new to the local materials. Clays were carelessly mined and badly prepared, and in many cases the men who attempted to make pottery were ignorant of anything but the processes of manipulation. It

is not strange, therefore, to find that the work of this period was very inferior, nor to learn that those who made it were inordinately vain of their productions. Every now and then some enterprising manufacturer would attempt an important piece of work, but the results were uniformly disastrous. There is almost nothing to show for the work of these years but a series of misdirected efforts.

The cause of the renaissance which, happily for the country, at length dawned, was the Centennial Exhibition of 1876. There, for the first time, non-traveling Americans were brought face to face with the productions of Europe, and the contrast with American work was very marked. The effect of the lesson was not immediate. Some manufacturers declined to be aroused, they were making money under a high protective tariff and were content to produce inferior wares. Those upon whom the influence was strongest were private individuals, painters, sculptors, and amateurs. A company of women got together and eventually established the Rookwood Pottery. (See ROOKWOOD.) On somewhat similar lines several small manufactories of glazed pottery have since been opened, among which are the Grueby faience, Boston; the Merrimac pottery, Newburyport, Mass.; Lonhuda ware, Steubenville, Ohio; Lonelsa ware, Zanesville, Ohio. During this period a number of English decorators sought employment in this country. They were somewhat stereotyped in style and secured short engagements in factory after factory. A few pieces were produced at each, and for some reason the output ceased. A number of similar works are therefore extant. They have been made in many places of differently composed wares, but all are decorated by the same band of artists. The identification of such wares becomes very difficult therefore, but they remain as an evidence of a desire on the part of the manufacturers for a higher grade of work.

The pottery centres of East Liverpool, Ohio, and Trenton, N. J., have grown into large and prosperous communities. A number of English workmen have settled in each place, and the English accent and English sports flourish. In each city there are upward of 40 establishments directly engaged in producing ceramic wares and the accessories thereto.

The types of ware included in the term pottery range themselves according to color, structure, use, and locality. Thus Rockingham, yellow ware, and cream color, abbreviated to C. C., are definitions arising from color. Granite, ironstone, opaque china, and hotel china, are judged by structure, a fine vitreous body; the term "use" defines sanitary and railroad ware, mortars and chemical stoneware, while locality gives names to Belleck, Rookwood, and other fancy wares.

C. C. ware is the lineal descendant of English earthenware; the materials used are similar (see POTTERY), but a higher temperature is uniformly employed in America. The term is no longer accurate. The cream color was due to the natural tint of the clays of which even the best contain a small percentage of iron, but the exigencies of trade have forced the potters to neutralize this by the addition of a blue stain. C. C. therefore can no longer be distinguished by its color.

CERAMIC SOCIETY — CERATOSA

Rockingham and yellow wares are virtually the same wherever made. Common buff-burning clays are used, and in the former ware the glaze is stained dark-brown by the use of manganese; in the latter a cheap lead glaze over the yellowish clay intensifies the color. Jet ware is usually made from a red clay covered with a blue glaze.

In the production of sanitary ware America holds the field. Great demands have been made upon the potters on account of increased domestic comforts and the elaboration of railroad fittings. The earthenware necessities of kitchen and bathroom have been brought to great perfection, both in composition of body and glaze and in methods of manufacture. See ENAMELED POTTERY.

No factory of any repute is without a complete plumber's apparatus by which every piece is tested for its action with water before being shipped.

Hotel china has also been brought to a highly satisfactory point. The demand of hotels and restaurants for a tough ware led a number of manufacturers into the experimental field. Costly as was the process, one after another has come forth successful. The conclusion to which all have arrived is that high temperature is the secret of success. The mixture of materials must of course be adjusted to suit the extreme heat, and there is no doubt that tons of pottery have been destroyed before the correct proportions were found. This ware is a distinctive American product. It can be matched against any pottery in the world of its own class without risk of failure. It has little or no pretence to artistic merit, for the decorations are, for the most part, inexpensive, but for withstanding the knocks of a strenuous life there is nothing so good. The principal factories making this ware are the Greenwood Pottery, the Lambertton Works, and the Crescent Pottery, of Trenton; the Knowles, Taylor & Knowles Company, of East Liverpool, Ohio; and the Onondaga Pottery, of Syracuse, N. Y.

Belleek ware had its origin in the town of that name in Fermanagh, Ireland, and the first ware made in America of this type was compounded by men who had worked in the old country, and was avowedly an imitation of the Irish product. It, however, speedily assumed a character of its own and was pursued on entirely different lines. The ware belongs to the class of soft porcelain. It is light, translucent and of a pale creamy color. The body is largely composed of feldspar, which is mined in Maine and Connecticut in great abundance. The glaze is a fusible compound in which lead oxide is largely present. This porcelain is greatly in demand for over-glaze painting. The soft glaze enables almost any ceramic color to be melted to a brilliant surface in any of the ordinary studio kilns. The best Belleek is made by the Ceramic Art Company and the Willetts Manufacturing Company, of Trenton, N. J.

An account of American ceramics would not be complete without a word on the enthusiasm for china-painting and clay-working which has possessed American women for the last two decades. The movement took serious shape soon after the Centennial Exposition, and may be said to have reached its height in 1893. In that year at the World's Fair a great quantity of so-called "amateur painting" was exhibited, and some of it was severely criticised. The

criticism was taken to heart and from that time the work greatly improved. Study-clubs were formed and more serious work undertaken, culminating, in a number of instances, in women undertaking to produce their wares from the clay, instead of being content to paint upon purchased pieces. This movement is yet in its infancy and must eventually exercise a large influence upon the quality of American clay-work.

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Ceramic (se- or ke-rām'ik) **Society, The American**, a body of scientific clay-workers organized in 1899. The 'Transactions' of the Society already form the most complete record of progress in ceramic knowledge published in the English language.

Cerar'gyrite, native chloride of silver, AgCl. It crystallizes in the isometric system, and is cubical in general habit. It has a specific gravity of 5.55, and is quite soft, with a grayish color and a resinous lustre. Upon exposure to light its color changes to a violet-brown. It occurs in Mexico, in western South America, in Norway, and in the Ural Mountains. In the United States it is found in Idaho, Utah, Colorado, Nevada, and Arizona. When found in quantity it is valuable as an ore of silver.

Cerastes, a genus of African vipers, remarkable for their fatal venom, and for two little horns formed by the scales above the eyes. Hence they have received the name of horned vipers. The tail is very distinct from the body. *C. cornutus* is the horned viper of northern Africa, a species known to the ancients. There are several other species.

Cerasus, a genus of trees, the cherries, of the order *Rosaceæ*, now always regarded as a section of the genus *Prunus*, distinguished from the other sections by the smooth, bloomless fruit, conduplicate vernation, and other characters. See CHERRY.

Cerates, official preparations of the United States Pharmacopœia. They are unctuous substances, consisting of oil or lard mixed with wax, spermaceti, or resin, to which various medicines may be added. In consistency they are harder than ointments and softer than plasters, and should be capable of being spread at ordinary temperatures on cloth, and should not melt at the temperature of the human body.

Ceratodus, sēr'a-tō-dūs, a genus of fishes belonging to the *Dipnoi* or lung-fishes. It is the barramunda or native salmon of the Australian rivers, measures from three to six feet in length, and forms an interesting connecting link between the oldest surviving group of fishes and the lowest air-breathing animals. It is said to leave the water and go on the flats after vegetable food, but its traveling powers cannot be great.

Cerato'sa, certain sponges in which the skeleton or solid support is horny. Another name is *Ceratospongia*. The skeleton consists of spongin, which differs chemically from the substance of true horn (keratin). The spongin is deposited in long fibres by peculiar cells (spongioblasts). The fibres interlace, branch, and unite into the supporting framework of the sponge. Examples of the horny or fibrous sponges are the bath-sponges, such as *Euspongia officinalis*, varieties of which occur in the Medi-

CERATOSAURUS — CEREALS

terranean and about the West Indies, Florida, etc. See SPONGE.

Ceratosauros, sĕ-rā-tō-sōr'ūs, a carnivorous dinosaur (see DINOSAURIA) resembling Allosaurus (q.v.), but of smaller size and with small horns over the eyes and on the nasal bones. It is found in the Como formation of Wyoming (Upper Jurassic Period).

Ceraunian (sĕ-rā'nī-ān) **Mountains**, in classical geography, (1) a mountain range in the southeastern part of the Caucasus Mountains, the exact position of which is not known; (2) a chain of mountains in Epirus, northern Greece, extending to the Adriatic and forming the peninsula Acroceraunium (q.v.). The mountains themselves are also called Acroceraunia.

Cerberus, sĕr'bĕ-rūs, in Greek myths, a three-headed dog, with snakes for hair. Hesiod describes him as fifty-headed, and states him to have been the offspring of Echidna by Typhon, the most terrible of the giants that attempted to storm heaven; but later writers give him only three heads. At his bark hell trembled, and when loosed from his hundred chains, even the Furies could not tame him. He watched the entrance of Tartarus, or the regions of the dead, and fawned on those who entered, but seized and devoured those who attempted to return. He was subdued by Heracles (Hercules).

Cercaria, sĕr-kā'rī-ā, the so-called "nurse" of the fluke-worm (q.v.) and other trematode parasites. The body is tadpole-like in shape, with an anterior and posterior sucker, a mouth and pharynx, and a forked intestine. The *Cercariae* are developed in the body of the parent-nurse (*redia*). Escaping from the *redia*, the cercaria, swimming about in pools or ponds, forces its way into the body of some snail, which forms its first host. Then, losing the tail, it becomes encysted, attached to blades of grass or herbage. The transference of the larval fluke to its final host, the sheep, is effected if the latter swallow the grass on which the cercaria has become encysted. The young fluke then escapes from the cyst, and forces its way up the bile-ducts to the liver, in which it rapidly grows, and developing reproductive organs, attains the adult condition. See TREMATODA.

Cercelée, sĕr-sĕ-lā, or **Recercelée**, in heraldry, applied to a cross, the ends of which are curled or twisted, like a ram's horn.

Cercis, sĕr'sis, a genus of plants of the order *Leguminosæ*. *C. canadensis*, redbud, or Judas-tree, is a small ornamental tree, often cultivated, but growing wild from New York south to Florida and west to Minnesota, Kansas, and Louisiana. *C. siliquastrum*, a native of the south of Europe, and of several countries in Asia, is a handsome, low tree with a spreading head. The leaves are remarkable for their unusual shape; they are of a pale, bluish-green color on the upper side, and sea-green on the under. The flowers, which have an agreeable acid taste, are often mixed in salads, and the flower-buds are pickled. The genus received the name of the Judas-tree from the tradition that it was upon a specimen of it, near Jerusalem, that Judas hanged himself.

Cercopithecidae, sĕr-kō-pī-thĕ'sī-dĕ, a family of primates, including all the Old World monkeys, except the anthropoid apes. The various groups and species may be found described under their names. See also MONKEY.

Cer'cyon, a famous robber, killed by Theseus.

Cerdic, kĕr'dik, king of the West Saxons: d. 534. He was a Saxon earldorman who invaded England in 495, and after gradually fighting his way and extending his conquests, established the kingdom of Wessex about 519. He won a great battle at Charford in 519, but suffered a severe defeat from the Britons in 520 at Mount Badon, or Badbury, in Dorsetshire. In 530 he conquered the Isle of Wight. At his death his kingdom extended over the present counties of Berkshire, Wiltshire, Dorsetshire, and Hampshire (including the Isle of Wight).

Cerdo'nians, an ancient sect, whose belief, half philosophical, half religious, was a confused mixture of Christian dogmas with Oriental dualism and Gnostic ideas. Their founder, Cerdo, was a Syrian, who came to Rome about the year 139 under the pontificate of Hyginus. He maintained the existence of the Zoroastrian two principles, one of good and the other of evil. The latter, according to him, was the creator of the world and the God and lawgiver of the Jews. The former was the creator of Jesus Christ, whose incarnation, sufferings, and death were only sensible appearances, and not vital facts. His disciples became confounded with those of Marcion, who some years later propagated similar opinions.

Céré, Jean Nicolas, zhōi nĭk-ō-lā sā-rā, French botanist: b. Isle of France 1737; d. there 2 May 1810. Under the direction of the French government he greatly extended the culture of spices in the Isle of France (now Mauritius), when that island was a French dependency. The agricultural society of Paris published his essay on the culture of rice, and awarded him a medal; and Napoleon confirmed him in his position as director of the botanical garden of the Isle of France, and conferred on him a pension of \$120. A tree of the island has been called after him, *Cerea*.

Cere, sĕr, the naked skin or fleshy sheath that covers the base of the upper mandible in some birds, through which it is supposed that a tactile sense is exercised.

Cerealia, sĕ-rĕ-ā'lī-ā (from Ceres, the goddess of the fields and of fruits) signified the productions of agriculture, also the festivals of Ceres, celebrated at Rome. The time at which they were celebrated is not known. According to some it was the Ides (13th) of April; according to others the 7th of the same month.

Ce'reals, a term derived from Ceres, the goddess of corn. Though sometimes extended to leguminous plants, as beans, lentils, etc., it is more usually and properly confined to the *Gramineæ*, as wheat, barley, rye, and oats, which are used as human food. In agriculture they are usually considered as exhausting crops, partly on account of their trailing roots; their mode of nutrition, which is effected more by the roots than by the leaves; their slender stems, which allow weeds to grow up and rob the soil; and from the necessity of allowing them to attain full maturity before they are reaped.

CEREALS — CEREMONIAL OF THE EUROPEAN POWERS

Accordingly it is considered one of the rules of good husbandry not to take two cereal or white crops in succession, but to make them alternate with root crops, which, growing in rows at some distance apart from each other, have the additional advantage of allowing weeds to be destroyed by means of repeated hoeings.

Cereals, or Cereal Plants, the grasses cultivated for their seeds which are used as food by man and animals. Sometimes also called bread-plants and, in Europe, corn-plants. The principal ones are treated in separate articles. See **BARLEY**; **MAIZE**; **MILLET**; **OATS**; **RICE**; **RYE**; **SORGHUM**; **WHEAT**.

Cerebellum, sĕr-ĕ-bĕl'ŭm ("the little brain") that portion of the brain situated behind and beneath the cerebrum. It is connected with the main brain mass by means of two feet or stems, the cerebellar peduncles, and is separated from the main brain mass in the cranial cavity by a thick layer of connective tissue, the tentorium cerebelli. It is also connected with the pons by a pair of middle peduncles, and with the medulla oblongata by the inferior peduncles. It thus forms a very integral portion of the brain mass. In general the form of the cerebellum in human beings is a flattened ovoid measuring from eight to ten centimeters from side to side, five to six centimeters from before backward, and five centimeters vertically. Its average weight is about 140 grams, which is one eighth of the weight of the whole cerebro-spinal axis. It is larger and heavier in the male than in the female, and is relatively larger in the adult than in the child. Like the brain, it is divided up into a number of lobes, of which three are most prominent, the middle portion, or vermis, and the two lateral lobes. The minute structure of the cerebellum is somewhat similar to that of the cerebrum, but there are certainly very marked differences, particularly in the development of a layer of very characteristic cells, the Purkinje cells. The interior of the cerebellum contains masses of gray matter, or nuclei. These are the dentate nucleus, the nucleus emboliformis, nucleus globosus, and the nucleus fastigii in the vermis. Through the inferior, middle, and superior peduncles fibres pass to and from the cerebrum, pons, medulla, and spinal cord, thus bringing the cerebellum into organic union with the rest of the nervous system. The functions of the cerebellum are not yet completely known, but it is certain that the cerebellum has a number of important functions, chief among which are those connected with locomotion and the act of balancing. Affections of the cerebellum often result in a peculiar form of staggering, known as cerebellar ataxia. See **BRAIN**.

Cer'eb'ral Hemorrhage. See **BRAIN, DISEASES OF**.

Cerebra'tion, an old term, much used in the early physiologies, designating an automatic reflex series of brain actions taking place below the threshold of consciousness. See **CONSCIOUSNESS**.

Cer'eb'rin, sĕr'ĕ-brĭn, a name that has been applied, at different times and by different chemists, to various substances that are obtainable from the brain and other parts of the nervous system by extraction with alcohol. It is now usually applied to a white, crystalline,

nitrogenous powder that is obtained by heating ox-brain with baryta, washing, drying, and finally extracting with alcohol. The cholesterin that is also present in the product so obtained may be removed by the action of ether, in which cerebrin is insoluble. Cerebrin does not combine with acids or bases, but by prolonged boiling with hydrochloric acid it is converted into a substance that can reduce Fehling's solution.

Cer'ebro-spi'nal, pertaining to the brain and spinal cord together, looked on as forming one nerve mass.

Cerebro-spinal Fluid. See **BRAIN**.

Cerebro-spinal Meningitis. See **MENINGITIS**.

Cerebrum. See **BRAIN**.

Ceremo'nial of the European Powers, certain forms of international etiquette or usage, which have arisen in Europe during modern times. No independent state can actually have precedence of another; but as the weaker seek the protection and friendship of the more powerful, there arises a priority of rank. This has occasioned the gradual establishment of dignities, rank, and acts of respect to states, their rulers, and representatives, by which means (in contradistinction to the internal etiquette of a state) an international ceremonial has been formed, which has been the source of confusion and war, and to the observance of which far more consideration is often paid than to the fulfilment of the most sacred contracts. Louis XIV. carried this folly further, perhaps, than any one before or after him. To this international ceremonial belong:

1. Titles of rulers. Accident made the imperial and regal titles the highest, and thus conferred advantages apart from the power of the princes. After Charlemagne, the emperors of the Romans were considered as the sovereigns of Christendom, maintained the highest rank, and even asserted the dependence of the kings on themselves. For this reason several kings in the Middle Ages, to demonstrate their independence, likewise gave their crowns the title of "imperial." England, for example, in all its public acts, is still styled the "imperial crown." The kings of France received from the Turks and Africans a title equivalent to emperor of France. In progress of time the kings were less willing to concede to the imperial title, of itself, superiority to the royal.

2. Acknowledgment of the titles and rank of rulers. Formerly the Popes and emperors arrogated the right of granting these dignities; but the principle was afterward established, that every people could grant to its rulers at pleasure a title, the recognition of which rests on the pleasure of other powers, and on treaties. Some titles were therefore never recognized, or not till after the lapse of considerable time. This was the case with the royal title of Prussia, the imperial title of Russia, the new titles of German princes, etc.

3. Marks of respect conformable to the rank and titles of sovereigns. To the "royal" prerogatives, so called (conceded, however, to various states which were neither kingdoms nor empires, such as Venice, the Netherlands, Switzerland, and the electorates), pertained the right of sending ambassadors of the first class, etc. In connection with this there is a much contested

CEREOPSIS — CERIGO

point, namely, that of precedence or priority of rank, that is of the right of assuming the more honorable station on any occasion, either personally, at meetings of the princes themselves, or of their ambassadors, at formal assemblies, etc., or by writing, as in the form and signature of state papers. There is never a want of grounds for supporting a claim to precedence.

As the councils in the Middle Ages afforded the most frequent occasion of such controversies, the Popes often intervened. Of the several arrangements of the rank of the European powers which emanated from the Popes, the principal is the one promulgated in 1504 by Julius II., through his master of ceremonies, in which the European nations followed in this order: (1) the emperor of the Romans (emperor of Germany); (2) the king of Rome; (3) the king of France; (4) the king of Spain; (5) of Aragon; (6) of Portugal; (7) of England; (8) of Sicily; (9) of Scotland; (10) of Hungary; (11) of Navarre; (12) of Cyprus; (13) of Bohemia; (14) of Poland; (15) of Denmark; (16) Republic of Venice; (17) Duke of Bretagne; (18) Duke of Burgundy; (19) Elector of Bavaria; (20) of Saxony; (21) of Brandenburg; (22) Archduke of Austria; (23) Duke of Savoy; (24) Grand-Duke of Florence; (25) Duke of Milan; (26) Duke of Bavaria; (27) of Lorraine. This order of rank was not, indeed, universally received, but it contained a fruitful germ of future quarrels; some states, which were benefited by the arrangement, insisting upon its adoption, and others, from opposite reasons, refusing to acknowledge it. To support their claims for precedence the candidates sometimes relied on the length of time which had elapsed since their families became independent, or since the introduction of Christianity into their dominions; sometimes on the form of government, the number of crowns, the titles, achievements, extent of possessions, etc., pertaining to each. But no definite rules have been established by which states are designated as being of the first, second, third, fourth, etc., rank. Rulers of equal dignity, when they make visits, concede to each other the precedence at home; in other cases, where the precedence is not settled, they or their ambassadors take turns till a compromise is effected in some way. In Great Britain and France far less ceremonial is observed, in the official style, than in Germany. Emperors and kings mutually style each other "brother," while they call princes of less degree "cousin." The "we," by which monarchs style themselves, is used either from an assumption of state or from a feeling of modesty, on the supposition that "I" would sound despotic, while "we" seems to include the whole administration, etc.

Ceremoniale, the book used in the Catholic Church containing the ceremonies and rites for all general religious functions. The term is restricted to the *Ceremoniale Episcoporum* (of the bishops) and *Ceremoniale Romanum*, special ceremonies and prayers being found in other books, such as Breviary, the Missal, etc. (qq.v.).

Cereopsis, sē-re-ōp'sis, the pigeon-goose, an Australian genus of the *Anatidæ* or duck family, and the subfamily *Anserinæ*, or geese.

Ceres, sē'rēz, the name given by the Romans to the Greek goddess of agriculture,

Demeter, when her worship was introduced into Rome. The origin of the name cannot be explained with certainty. It is not Latin; but some think that it was Etruscan, among whom, according to Servius, Ceres was one of the Penates. Others think that Ceres may be the same with the Greek Cora, or Core (that is, "maiden"), another name for Persephone, the daughter of Demeter, with whom Demeter herself was often confounded. The worship of Demeter, or Ceres, was introduced into Rome from Sicily at the beginning of the 5th century B.C., and the first temple to her was vowed by the dictator, A. Postumius Albinus, 496 B.C. Her worship soon acquired a considerable degree of political importance. As usual when the Romans introduced the worship of a foreign divinity into their own city, they adopted all the legends connected with that divinity, adapting them to their own mythology. Thus, since Demeter was said by the Greeks to be the daughter of Kronos and Rhea, and accordingly sister of Hera, Aïdes (or Hades), Poseidōn, Zeus, and Hestia, so Ceres was regarded by the Romans as the daughter of Saturn and Ops, and sister of Juno, Pluto, Neptune, Jupiter, and Vesta; and so also the Persephone of the Greeks became the Proserpine of the Romans. See DEMETER.

Ceres, the name of the first asteroid discovered. It was discovered by Piazzi 1 Jan. 1801. Having observed it at Palermo, in Sicily, he called it Ceres, after the old tutelary divinity of that island. Under favorable circumstances it has been seen by the naked eye as a star of the seventh magnitude, but more generally it looks like one of the eighth magnitude; some observers call the light reddish and perceive a haze about the planet.

Cereus, sē'rē-us, a genus of plants of the order *Cactacæ*, remarkable for their singularity of form and the beauty of the flowers. *C. giganteus*, the Suwarrow or Saguaro of the Mexicans, is the largest and most striking of the genus. It rises to the height of 50 or 60 feet, and looks more like a candelabrum than a tree of the normal type. Other notable species are *C. senilis*, the long gray bristles of which give it the appearance of the head of an old gray-haired man. *C. grandiflorus* is the night-flowering cereus, but there are others which also flower at night. *C. speciosissimus*, an erect plant, commonly cultivated in greenhouses, is a native of Mexico. *C. flagelliformis*, a creeper, is not unfrequently met with in gardens. The members of the genus are generally useful as cardiac agents and antipyretics,—particularly the Mexican fever-few, *C. Bonplandi*.

Cerignola, chā-rēn-yō'lā, Italy, a town in the province of Foggia, and 24 miles southeast from the city of Foggia. It has a college, several convents, and a hospital. The inhabitants manufacture linen; and the district produces large quantities of almonds and cotton. In 1503 the Spaniards, under Gonzales, Duke of Cordova, here defeated the French, when the Duke de Nemours, who commanded the latter, was slain. Pop. 34,000.

Cerigo, chā'rē gō (ancient CYTHERA), an island in the Mediterranean, separated from the southern coast of the Morea by a narrow strait. It formerly belonged to the Ionian Republic of the Seven Islands, but since 1864 has been part

CERINTHUS — CERNUSCHI

of the kingdom of Greece; area about 106 square miles. Cerigo, with the neighboring islands, now forms one of the eparchies belonging to the province or nome of Argolis and Corinthia. It is rather rocky and mountainous. Grain, wine, olives, and other fruits are raised. Sheep and goats constitute the chief live stock. The people are of Greek origin, and are all of the Greek Church. At an early period a Phœnician colony was founded here. Later it was successively under the control of Argos, Sparta, and Athens, and finally fell into the hands of the Romans. After submitting to Venice and then to Turkey, in 1718, it was once more assigned to Venice. It was annexed to France in 1807; two years later it was occupied by the English; and since 1815 it has shared the fate of the Ionian Islands. It was anciently sacred to Aphrodite (Venus), who was also called Cytherœa. Pop. 12,306.

Cerin'thus, one of the first heresiarchs who, according to St. Irenæus in his work, 'Against Heresies,' was contemporary with the evangelist St. John; but Tertullian and Epiphanius refer him to the time of Hadrian. In Irenæus' work, as also in the 'Philosophumena,' attributed variously to Origen and Hippolytus, bishop of Ostia, Cerinthus is represented as an alumnus of the pagan philosophical schools of Alexandria; but he broached his heretical doctrines in Asia Minor, and there had a numerous following. The universe, he taught, is not the work of the First God, but was created by some angelic power far inferior to the supreme power. Jesus he held to be the son of Joseph and Mary, born as other men are born, but excelling all in righteousness, wisdom, and understanding. Cerinthus taught also that upon Jesus, after his baptism by John, descended the Christos from the power which is supreme over all, in the form of a dove, and that when Jesus proclaimed the unknown Father and wrought miracles; but that at the end of the passion the Christos flew away out of Jesus, and Jesus suffered, but that the Christos remained impassible, being the spirit (or breath) of God. Angels play a conspicuous part in the system of Cerinthus. Thus it was an angel, he says, that gave the law to Moses; and the Jahve of Israel was an angel. Cerinthus and his followers entertained a special animosity against St. Paul and St. John, and the heresiarch is credited with writing an apocalyptic book in rivalry with St. John. He is said to have been a believer in the millennial reign of the Christ upon the earth.

Ce'rite, sē'rīt, a mineral occurring only at Riddarhyttan, in Sweden, and containing the rare element cerium, and others of the cerium group. Its formula is not certainly known, but the mineral may be described as a silicate of the metals of the cerium group, combined with small quantities of calcium and iron. It is mostly massive or granular, but crystals belonging to the orthorhombic system are sometimes found. Cerite has a hardness of about 5.5, and a specific gravity of about 4.9. It has a peculiar and characteristic color, intermediate between clove-brown and cherry-red, shading off to a gray.

Cerito, Francesca, frän-chës'kâ chā-rē'tō, commonly called FANNY, Italian danseuse: b. Naples 1823. She was the daughter of an officer who served in the Neapolitan army under Murat,

and made her début at the 'San Carlo theatre in 1836, and, although only 13, was received with great enthusiasm. At Milan, in 1838, and for two years at the Kärnthertheatre in Vienna, and afterward in Paris and London, everywhere the same storm of applause greeted her appearance, especially in London. She excelled most in lively, gentle, arch, and delicate gestures and attitudes, and less in heroic or classical parts. In 1850 she separated from her husband, Mr. St. Leon, who was well known in Paris and London as dancer and violinist.

Ce'rium, sē'rī-ŭm, a metallic element the oxide of which was discovered and recognized as a new substance in 1803 by Klaproth, and, independently, by Berzelius and Hisinger. It was named for the minor planet Ceres, which was also discovered at about the same time. The principal source of cerium is the mineral monazite (q.v.), which is a silicate of cerium and certain other allied elements. Cerium forms a basic nitrate that is insoluble in water, and this fact affords a ready means of separating the metal from the other elements with which it is almost invariably associated. Metallic cerium may be obtained by electrolysis of the anhydrous chloride, or by melting the anhydrous chloride with metallic sodium. Thus prepared, cerium is a steel-gray metal, ductile and malleable, and melting at a temperature probably not far from the melting-point of silver. Its chemical symbol is Ce, and its atomic weight is 140 if O = 16, and 139 if H = 1. It has a specific gravity of from 6.6 to 6.75, and a specific heat of about 0.0448. It does not change in dry air, but in moist air it oxidizes superficially. It decomposes cold water slowly, and hot water quickly. Two oxides of the metal certainly exist, one having the formula Ce₂O₃, and the other the formula CeO₂. Three other oxides have also been described, with the formulæ CeO₃, Ce₂O₅, and Ce₄O₉; of these the first probably exists, but the other two still need confirmation. Oxide of cerium is also used in the manufacture of the better grades of incandescent gas-mantles. A fabric of cotton is woven of the desired form, and this is impregnated by repeated dipping in a solution of the nitrates of cerium and thorium. On ignition the cotton burns away, and the nitrates are converted into oxides, which give the intense luminosity desired. A mixture of 99 per cent of thorium oxide to 1 of cerium oxide gives the best results.

In medicine the insoluble salts of cerium are used, cerium oxalate alone being officinal. It resembles the insoluble bismuth compounds in its action, being a sedative to mucous membranes, and it is much used as an antemetic, particularly in the nausea of pregnancy. The soluble salts of cerium are poisons, their action being similar to the soluble salts of bismuth.

Cernuschi, Enrico, ěn-rē'kō chër-noos'kē, Italian economist: b. Milan, Italy, 1821; d. Mentone 12 May 1896. He was graduated at Pavia in 1842, fought for liberty in the insurrection of 1848, and was obliged to flee from Italy, owing to political proscription. He acquired a large fortune in Paris as a banker, but owing to the hostility of the communists left France in 1871 and traveled extensively in Egypt, China, Japan, England, and the United States, visiting the last-named in 1877. He was an ardent bi-metallist, and published 'Mecanique de

CERO — CERRO DE PASCO

l'Échange' (1865); 'Illusions des Sociétés cooperatives' (1886); 'Discours' (1871); 'Silver Vindicated' (1876); 'Le Bi-métallisme à quinze et demi' (1881); 'Anatomie de la Monnaie' (1886); etc.

Cero, sēr'ō, a large, edible fish (*Scomberomorus regale*) of the western Atlantic, and similar to the Spanish mackerel. Another species (*S. caballa*), also called "sierra" or "king-cero" is found in the southern Atlantic, and reaches double the weight of the former, often attaining 100 pounds.

Ceroxylon, a genus of South American palms.

Cerquozzi, Michelangelo, mē'kēl än'jā-lō chār-kwōt'zē, Roman painter: b. Rome 1602; d. 1660. He received the surname *delle battaglie* (battle-painter), and at a later period that of *delle bambocciate*, because, in imitation of Peter Laar, he painted ludicrous scenes taken from low life, such as that to be seen at fairs and markets, and among the Lazzaroni. In his later years he painted flowers and fruit.

Cerretti, Luigi, loo-ē'jē chēr-rēt'tē, Italian poet and rhetorician; b. Modena 1 Nov. 1738; d. Pavia 5 March 1808. The purity and elegance of his diction made him, at an early age, the most distinguished professor of rhetoric and oratory in Italy. His 'Poems and Select Prose,' collected into a posthumous volume, were instantly successful, and have retained their rank ever since.

Cerro Blanco, the highest mountain in New Mexico; summit, 14,269 feet.

Cerro Gordo, thēr rō gōr'dō, or sēr'ō gōr'dō ("Big Hill"), a famous mountain pass in Mexico, the scene on 18 April 1847, of one of the sharpest battles of the Mexican war. After the capture of Vera Cruz on the coast, Gen. Scott moved northwest toward the City of Mexico, along the National Road. Some 50 miles from Vera Cruz this leaves the steaming lowlands and climbs a steep rocky plateau, an eastern spur of the great mountain range, seamed with ravines and thick with chaparral, and pierced by the defile of the little Rio del Plan. To this defile the road after crossing it and leaving it by a loop to the north among the mountains, returns at a ravine separating a sharp rocky ridge called Atalaya from a conical eminence termed Telegraph Hill. West of this again is the small hamlet called Cerro Gordo, which gives its name to the pass. On 9 April Santa Anna began fortifying Telegraph Hill, and from the 12th pushed on the work with all his force; accumulating about 12,000 men, the bulk at Cerro Gordo, but neglecting to occupy Atalaya. On the 11th, Scott's vanguard under Twiggs and Harney came up to Rio del Plan at the foot of the plateau, where the road crosses the river, drove away a few Mexican lancers, established a camp, and began reconnaissances. Santa Anna, in place of attacking the scattered detachments, confided in his strong position, and the lowland fevers which must force the Americans to fight him, and waited. By the 17th most of Scott's forces had come up; and he pushed Twiggs forward within easy striking distance. The latter, finding Atalaya undefended occupied it just as a Mexican detachment advanced to do so, routed them, and chased them in headlong flight half

way up Telegraph Hill. The whole American army, about 8,500, being now at hand, Scott issued orders for a general advance next day. Santa Anna's line extended from Telegraph Hill to a road at the ravine, and eastward for a mile along the heights overlooking the National Road, which end in a precipitous rocky bluff 100 feet high; then back over three ridges terminating in rocky knolls, to the river defile. In front of the batteries and infantry, the chaparral had been cut down and piled into an abatis for several hundred feet. The Americans, on the other hand, planted powerful batteries on Atalaya, and enfiladed the Mexican right with a howitzer across the river. Scott's plan was simple, but brilliantly effective, though the impassable ground made it fall short of the full intention. Since the Mexicans expected the chief attack on their right, he resolved to make only a feint there and assuming that they expected him to move forward along the road resolved not to do so. In the meantime he ordered the roads cleared around the hills to the north in order that by making a circuit to the National Road in the rear of the Mexicans he might cut off their retreat. On the morning of the 18th Pillow assailed the right; the artillery on Atalaya rained shot and shell with terrific effect on Telegraph Hill, the road batteries, Santa Anna's camp, and even his reserves, and the howitzer over the river added its discharge. Twiggs, Shields, and Worth, with Riley, then moved along the circuit till on the north flank of Telegraph Hill, at first out of sight, then in full range of the Mexican fire. Santa Anna detached part of the forces on Telegraph Hill to drive them back; then Harney from Atalaya swept over the crest and down the side, up Telegraph Hill till within 200 feet of the batteries and below their range. There he reformed and in one final charge utterly routed the Mexicans, at the same time turning the forces on the hill against the main body of Mexicans at Cerro Gordo. The entire right, its retreat cut off, threw down its arms and surrendered. The main body broke up in a panic as the fugitives from Telegraph Hill rushed among them and the guns from that quarter cut them down and fled wildly down the craggy slopes and to the defile, and westward along the road. The Mexicans lost 1,000 or 1,200 in killed and wounded; about 3,000 prisoners, including five generals, and 299 other officers; 43 guns, and 3,500 small arms. The Americans lost 63 killed and 368 wounded. The victory laid open the road nearly to the Mexican capital.

Cerro de Pasco, sēr'ō dā pās'kō, Peru, capital city of the department of Junin, at the northern extremity of the plateau of Bourbon, 14,275 feet above the level of the sea. The town came into existence in 1630, in consequence of the discovery of veins of silver there by an Indian. The streets are narrow and crooked, and the houses small and without windows or balconies. The inhabitants are a mixture of all races and nations, who make their living by the produce of the mines. From October to July hail-storms, mists, and snow-falls make the place almost intolerable, and in summer with the exception of a few clear days the climate is little better. On account of the extreme rarity of the air the difference in temperature

CERRO GORDO DE POTOSI — CERVANTES SAAVEDRA

in the sun and in the shade is great. Cerro de Pasco still contains the most productive mines in all Peru, although they no longer yield the almost fabulous wealth that the Spaniards are said to have derived from them. Many of the shafts leading down to the veins of silver are in the town itself, and have their openings either in little huts or in the dwellings of the owners of the mines. According to the greater or smaller depth of the diggings they are called *minas* or *cortés*. The silver is found partly pure, and partly in ores containing from 25 to 80 per cent of the precious metal. Pop. (very variable) about 7,000.

Cerro Gordo de Potosi, da pō-tō-sē', a mountain in the Andes of Bolivia; southwest of Potosi, 16,150 feet high. It is remarkable for its deposits of silver.

Cerro Largo, sēr'rō lār'gō, a department in the northeast of Uruguay, well watered, with large savannahs and forests. Area, 5,729 square miles. Capital, Cerro Largo or Melo. The inhabitants are chiefly engaged in cattle-raising. Pop. 36,000.

Cerros, or **Cedros Island**, an island belonging to Mexico, in the Pacific Ocean, off the west coast of Lower California. It is for the most part mountainous and barren, but is thought to possess mineral wealth. Area, 12 square miles.

Certaldo, Italy, a town of Tuscany, partly on a conical height, and partly on a flat along the right bank of the Elsa, 15 miles southwest from Florence. It is the birthplace, was long the home, and now contains the ashes of Boccaccio. His house is still shown, and in one of its rooms are collected numerous relics of the author of the 'Decameron,' and a large fresco painting of him by Benvenuti of Florence.

Certiorari, sēr-tē-ō-rā-rī, or sēr-shē-ō-rār'ī, in law, a writ, the purport of which is to remove convictions, orders, or proceedings before magistrates, indictments, and records in civil actions before judgment, from inferior courts into the courts above, with a view that the party may have justice done to him, or that the superior court may see whether the justices or court below, before which the proceedings have taken place previously to the certiorari being obtained, have kept within the limits of their jurisdiction. This writ, from the moment of its delivery to the judges of the court below, or magistrate, suspends their power, and any subsequent proceedings by them are void and without legal effect. Although the writ of certiorari removes the record from the inferior court into the court above, yet the court above does not take up the cause where the proceedings stopped, but begins entirely anew. Procedure by appeal has largely superseded that by certiorari.

Ceruleum, a blue pigment, consisting of stannate of protoxide of cobalt mixed with stannic acid and sulphate of lime.

Ceru'minous Glands, the glands of the ear which secrete the cerumen or wax which lubricates the passage to the tympanum and prevents the entrance of foreign matter.

Cerussite, the native lead carbonate, $PbCO_3$. It is common in orthorhombic crystals, very frequently stellately twinned. It also

abounds in massive, earthy and stalactitic forms. It is very brittle, has a hardness of 3. to 3.5 and the high specific gravity of 6.5. It is usually translucent and of an adamantine or pearly lustre. Its color is white or gray, though green and yellow tints are not uncommon. It is one of the most abundant and valuable ores of lead, and often carries silver. It is formed from galena by the action of solutions of calcium bicarbonate. Among its many important localities are Broken Hill in New South Wales, Ems in Germany, and Phoenixville, Pa.

Cerutti, Giuseppe Antonio Gioachimo, joo-sēp'pě än-tō'nē-ō jō-ä-kē'mō chā-roo'tē, Italian Jesuit theologian: b. Turin 13 June 1738; d. Paris, February 1792. He was one of the most eminent professors in the Jesuit College at Lyons and his 'Apology for the Jesuits' attracted much attention. He had already published two discourses upon the means of preventing duels, and on the reasons why modern republics have not reached the splendor of the ancient. The last received the prize of the Academy of Dijon. He was at Paris when the Revolution broke out in 1789. Abandoning his former principles he became one of the most zealous supporters of the new order of things. He was intimately connected with Mirabeau, and labored much for him. He also published several pamphlets, among which was a 'Mémoire sur la Nécessité des Contributions Patriotiques.' In 1791 he was a member of the legislative assembly. Some time after he delivered, in the Church of St. Eustache, a funeral discourse upon Mirabeau. The city of Paris called a street after his name.

Cervantes Saavedra, Miguel de, mē-gěl' dā thār-bän'tēs sä-ä-bā drä, Spanish poet and novelist, one of the great writers of modern times: b. Alcala de Henares 9 Oct. 1547; d. Madrid 23 April 1616. His parents removed to Madrid when he was about seven years old. Their limited means made it desirable that he should fix on some professional study, but he followed his irresistible inclination to poetry, which his teacher, Juan Lopez, encouraged. Elegies, ballads, sonnets, and a pastoral, Filena, were the first productions of his poetical genius. Poverty compelled him to quit his country at the age of 22, to seek maintenance elsewhere; he went to Italy, where he became page to the Cardinal Giulio Acquaviva, in Rome. In 1570 he served under the papal commander, Marco Antonio Colonna, in the war against the Turks and African corsairs, with distinguished courage. In the battle of Lepanto, in 1571, he lost his left hand. After this he joined the troops at Naples, in the service of the Spanish king. In 1575, while returning to his country, he was taken by the corsair Arnaut Mami, and sold in Algiers as a slave. He remained in slavery for seven years, but servitude, far from subduing his mind, served to strengthen his faculties. Vincente de los Rios and M. F. Navarrete, his chief biographers, relate the bold but unsuccessful plans which he formed to obtain his freedom. In 1580 his friends and relations at length ransomed him. At the beginning of the following year he arrived in Spain, and from this time lived in seclusion, entirely devoted to the muses. It was natural to expect something uncommon from a man who, with inexhaustible invention, great richness of imagination, keen wit, and

CERVANTES — CERVIDÆ

a happy humor, united a mature, penetrating, and clear intellect, and great knowledge of real life and mankind in general. But it rarely happens that expectation is so much surpassed as was the case with Cervantes. He began his new poetical career with the pastoral novel 'Galatea' (1584), in which he celebrated his mistress. Soon after the publication of this he married. Being thus obliged to look out for more lucrative labor he employed his poetical genius for the stage; and in the course of 10 years furnished about 30 dramas, among which his tragedy called 'Numancia' is particularly valued. He was not so successful in another kind of drama particularly favored by the Spaniards, a tangled mixture of intrigues and adventures; and this was doubtless the cause of his being supplanted by Lope de Vega, who was particularly qualified for this kind of composition. He consequently gave up the theatre, but it seems not without regret. From 1588 to 1599 he lived retired at Seville, where he held a small office. He did not appear again as an author till 1605, when he produced the first portion of that work which has immortalized his name,—'Don Quixote.' Cervantes had in view by this work to reform the taste and opinions of his countrymen. He wished to ridicule that adventurous heroism with all its evil consequences, the source of which was the innumerable novels on knight-errantry. The beginning of the work was at first coldly received, but soon met with the greatest applause, in which, at a later period, the whole of Europe joined. Cervantes' true poetical genius was nowhere so powerfully displayed as in his 'Don Quixote,' which, notwithstanding its prosaic purpose and its satirical aim, is full of genuine poetry. While it struggles against the prevailing false romance of the time, it displays the most truly romantic spirit. The extraordinary good fortune of the work did not extend to the author. All his attempts to better his condition were unsuccessful, and he lived contented with his genius and his poverty, and a modest though proud estimation of his merits. After an interval of some years, he again appeared before the public in 1613, with 'Twelve Novels' (which may be placed by the side of Boccaccio's), and in 1614 his 'Journey to Parnassus'—an attempt to improve the taste of his nation. In 1615 he published eight new dramas, with intermezzos, which, however, were indifferently received. Envy and ill-will, in the meantime, assailed him, and endeavored to deprive the neglected author of his literary fame; for which the delay of the continuation of 'Don Quixote' afforded the pretext. An unknown writer published, under the name of Alonzo Fernandez de Avellaneda, a continuation of this work, full of abuse of Cervantes. He felt the malice of the act painfully, but revenged himself in a noble manner by producing the continuation of his 'Don Quixote' (1615), the last of his works which appeared during his lifetime; for his novel 'Persiles and Sigismunda' was published after his death. He found a faithful friend in the Count of Lenos, but poverty, his constant companion through life, remained true to him till his last moments. He died on the same day as Shakespeare, in Madrid, where he had resided during the last years of his life. He was buried without any cere-

mony, and not even a common tombstone marks the spot where he rests. In addition to his celebrity as an author, he left the reputation of a man of a firm and noble character, clear-sighted to his own faults and those of others. Among the best editions of 'Don Quixote' are the one published at Madrid by Joaquin Ibarra, in 1780, considered a masterpiece of typography; that of Pellicer (Madrid 1798), and that of D. Diego Clemencin, with an excellent commentary (Madrid 1833-9). Many of his works are translated; 'Don Quixote' into all the languages of Europe. Among the English translations may be mentioned those of Motteux (1719); Jarvis (1742); and Smollett (1755). Several noteworthy English translations have been made in recent years: by Duffield (1881); Ormsby (1885); and Watts, (1888-9), containing life of the author, notes, bibliography, etc.

Cervantes, Philippines, capital of the province of Lepanto, situated near the centre of the province in the northwestern part of the island of Luzon, 3 miles from Cayán, the former capital. It is on a road connecting it with Benguet, and is 78 miles from Dagupan, which is the nearest point on the railroad. Pop. 16,000.

Cervantite, or **Antimony Ocher**, is native antimony tetroxide, Sb_2O_4 . It usually occurs in crusting stibnite and other antimony ores. It has a pale yellow color and greasy lustre.

Cervera y Topete, Pascual, päs'kwäl thär-bä'rä ē tō-pä'tā, Spanish naval officer: b. province of Jerez 18 Feb. 1833. He was of noble birth, his mother being a daughter of Count Topete y Valle. He was graduated at the Naval Academy of San Fernando; entered on active service in 1851; and was made first lieutenant in 1859; captain in 1868; and admiral subsequently. He was a prominent factor in the 10-years' war in Cuba, when he succeeded in blockading the ports and preventing the landing of filibusters; was sent to London as a representative of Spain to take part with other nations in a conference bearing on naval questions of international importance; and commanded the fleet sent against the American squadron operating in Cuban waters after the declaration of war in 1898. He took refuge in the inner harbor of Santiago de Cuba, and when, on 3 July, he attempted to escape, under imperative orders from his superiors, his entire fleet was destroyed by the squadron under the official command of Rear-Admiral Sampson and the actual command (in the temporary absence of that officer) of Rear-Admiral Schley. Admiral Cervera and his surviving officers were sent to Annapolis, Md., as prisoners of war, and soon afterward were released and allowed to return to Spain. He is a man of cultured and genial manners, of a kindly disposition and a gallant officer, for whom his captors felt the greatest admiration and sympathy.

Cervidæ, sēr'vī-dē, the deer family, a group of ruminant ungulates, including, besides the typical deer, the reindeer, the musk-deer, and others. The most noticeable characteristic of the entire group is the presence, in the males, or "bucks," of branched appendages to the skull, called antlers. These are, however, lacking in certain species, which, despite this fact, are very evidently closely related to the antlered deer. The antlered animals shed these

CERVIN — CESAROTTI

ornaments annually and develop new ones. (For growth and reproduction of these, see ANTLERS.) All deer have a large unossified space in the fore part of the skull which prevents the lachrymal bone from coming in contact with the nasal bone, as in the ox family. In the deer without antlers the upper canine teeth are especially well developed for defensive purposes; but they are generally present in all species; and, with the exception of the musk-deer, the *Cervidæ* have no gall-bladders. Though not nearly so numerous as such families as that of the ox, the deer family includes a variety of genera and numerous species, widely distributed, so that we find representatives throughout the Old World, except in Australia and southern Africa, and in both continents of the New World. Deer are generally found in forests or grass-lands, and never in deserts. They are, historically considered, older than the other families of ruminants, dating back to the Lower Miocene Period, when they were very small and without antlers. With the gradual change in other directions, such as the variation in dentition and the increased size, the antlers have been produced and amplified, so that the deer of the present is a far larger and finer-looking animal than his fossil ancestor. In the matter of antlers the young stag typifies the evolution of the race; as a yearling, his antlers are merely one-pronged spikes; but each successive year they become more branched and forked until, at maturity they may have seven or even more branches.

All deer are supplied with a coat of short fur, dull in tone, for protection, ranging from reddish-brown to gray; and usually white below. Those that are marked bear such markings on the face and throat and on the tail. Only a few genera are spotted. In most genera only the young (the fawns) are spotted; and lose their spots when they are about one year old. Deer breed annually, the young, one or two at a birth, being produced in late spring. The fawns remain with their mothers until they are about a year old, when they are sufficiently mature to become independent. The grass-land deer, especially, are gregarious, and often gather in large herds at the approach of winter. These feed on the meadow herbage, whereas the forest deer eat the leaves, twigs, and buds of bushes. In all, about 60 species are known. They are included within the following genera: *Cervus*, the red deer; *Cervulus*, the Asiatic muntjacs; *Elaphodus*, the tufted deer; *Rangifer*, the reindeer; *Alces*, the elk; *Capreolus*, the roe-deer; *Hydropotes*, the water-deer; *Cariacus*, the American deer; *Pudua*, the Andean deer; and *Moschus*, the musk-deer. All these, except *Moschus*, form the sub-family *Cervinæ*; *Moschus*, by itself, forms the sub-family *Moschinæ*. See DEER, and the English names of the various species.

Cervin, Mont (German, *Matterhorn*; Italian *Monte Silvio*), a mountain, Switzerland, Pennine Alps, on the southern frontiers of canton Valais, about six miles west-southwest of Zermatt, from which a road leads to the Col St. Theodule, a pass over the mountain into Piedmont. It is one of the most magnificent objects in nature, being an almost inaccessible obelisk of rock starting up from an immense glacier, to a height scarcely 1,000 feet lower

than that of Mont Blanc. The glacier, which differs from the lower glaciers in not being included between bold walls, but occupying a vast and desolate table-land, is nearly 10,000 feet above sea-level. The height of the peak is 14,837 feet. It is composed of felspar slate or gneiss. The peak was first ascended by a party of four English travelers and three guides in July 1865, but three of the party and a guide perished in the descent. (See Whymper's 'Scrambles Among the Alps'). On the summit of the pass, 11,096 feet, are the remains of a rude fortification, supposed to have been erected two or three centuries ago, to prevent incursions from the Valais.

Cervolle, or **Cervole**, **Armand de**, är-män dè sër-völ, French bandit chief, surnamed "The High Priest." He was taken prisoner with King John at the battle of Poitiers in 1356, and after being ransomed, plundered the south of France with a band of troopers (*routiers*), and exacted tribute from Innocent VI. at Avignon. He served for a time under the Dauphin; pillaged Burgundy, Champagne, Alsace, and Lorraine; was made Chamberlain to Charles V. in 1365; and was murdered in 1366.

Cesalpino, or **Cæsalpin**, **Andrea**, än'drā-ä chā-zäl-pē'nō, Italian botanist and physiologist: b. Arezzo, Tuscany, 1519; d. Rome 23 Feb. 1603. He studied and taught medicine and botany at the University of Pisa, and was physician to Pope Clement VIII. He was the author of a valuable work ('On Plants,') in which he classified plants by their parts of fructification. To this work Linnæus, Jussieu, and other subsequent botanists were greatly indebted for their ideas of botanical classification. In his 'Peripatetic Investigations' he propounded the theory of the circulation of the blood, afterward adopted and demonstrated by Harvey.

Cesar Birotteau, sã-zär bē-rõt-tō, **The Greatness and Decline of**, a novel by Honoré de Balzac. It portrays in a striking and accurate manner the bourgeois life of Paris at the time of the Restoration.

Cesares'co, **Countess Martinengo**. See MARTINENGO-CESARESCO, COUNTESS.

Cesari, **Giuseppi**, joo-sëp'pë chā zä rē (sometimes called *IL CAVALIERE D'*), Italian painter: b. Arpino about 1568; d. Rome 3 July 1640. He was greatly honored by no less than five Popes. His works—in fresco and oil—display lively imagination, and great tact in execution.

Cesarotti, **Melchior**, mël-kē-ō'rē chā-zä-rõt'tē, Italian poet and scholar: b. Padua 15 May 1730; d. Solvaggiano 3 Nov. 1808. He devoted himself to the belles-lettres, and was soon chosen professor of rhetoric in the seminary in which he was educated. He translated three tragedies of Voltaire,—'Sémiramis,' 'La Mort de César,' and 'Mahomet.' In 1762 he went to Venice, where he translated Ossian into Italian, and was, in 1768, appointed professor of the Greek and Hebrew languages in the University of Padua. Here he published his translation of Demosthenes and of Homer, and his course of Greek literature. After the establishment of the republican government, in 1797, he was appointed by the existing authorities to write an 'Essay on Studies.' In this he made suggestions for the improvement of education. In

CESENA — CESTIUS

1807 appeared his poem called 'Pronea' (Providence), in praise of his benefactor, Napoleon, who made him the same year knight of the Iron Crown. In spite of his advanced age he subsequently occupied himself with an edition of all his works; but his death prevented the completion of this enterprise. The edition of his works that had been begun during his life was completed by his friend Giuseppe Barbieri (1805-13).

Cesena, *chā-zā'nā*, Italy, a city in the province of Forlì, central Italy, on the right bank of the Savio. Among its buildings are a library founded in 1452 by Domenico Malatesta Novello, which possesses 4,000 precious manuscripts; a Capuchin church containing one of the best of Guercino's paintings, and a noble cathedral. Productive sulphur mines are in the neighborhood; and the region has been noted ever since Roman times for the excellence of its wine. Cesena was the birthplace of Popes Pius VI. and VII. In 1357, under Maria Ordellaffi, it made a famous defense against Alborno; but in 1377 it was barbarously pillaged by Robert of Genf. On 30 March 1815, Murat gained a victory at this place over the Austrians. Pop. 12,000.

Cesium. See **CÆSIUM**.

Ce'sius, Bernar'dus, Italian philosopher: b. Modena about 1581; d. there 1630. He became a professor of philosophy and theology at Parma, and afterward at Modena, where he died of the plague. He is best known by his work entitled 'Mineralogia, sive Naturalis Philosophiæ Thesauri; Lugduni' (1636), in folio, which contains no important observations by the author himself, but is useful as being a laborious collection of everything relating to the mineralogy of the ancients, and as showing what minerals were then familiarly known.

Cesnola, Luigi Palma di, *loo ē'jē pāl mā dē chēs-nō'lā*, American archæologist: b. Piedmont, Italy, 29 June 1832; d. New York 22 Nov. 1904. He served in the Italian war with Austria and came to the United States in 1860, serving in the Civil War, and attaining the rank of brigadier-general. He was United States consul at Cyprus (1865-77), where he made extensive archæological discoveries. In 1878 he became a trustee and director of the Metropolitan Museum of Art, in New York, a post he held till his death. In 1897 he was awarded a Congressional medal of honor for conspicuous military service. He published 'Cyprus: Its Cities, Tombs, and Temples,' and many monographs on art topics.

Céspedes, Pablo de, *pāb'lō dā thēs'pā-dēs*, Spanish painter, sculptor, architect, and poet: b. Cordova 1538; d. there 26 July 1608. In 1556 he entered the University of Alcalá de Henares, where he distinguished himself by his proficiency in the classics and Oriental languages. He also assiduously cultivated his genius for the fine arts. Having at last made these his principal pursuit, he proceeded to Rome, studied under Zuccherò and Michael Angelo, and soon became renowned both for his frescoes and sculptures. In 1577 he obtained a prebend in the Cathedral of Cordova, and from that time resided alternately in his native town and in Seville. His best pictures are in Cordova, Seville, Madrid, and several towns of Andalusia;

and are admired particularly for elegance and loftiness of design, complete knowledge of anatomy, the skilful employment of light and shade, warmth of coloring, accuracy of expression, and spirituality of composition. One of his most celebrated pictures is a 'Lord's Supper,' in Cordova Cathedral. He was the head of the then Andalusian school of painting, and numbered among his pupils some painters of distinction.

Céspedes y Borges, ē bôr'-gās, Carlos Manuel de, Cuban insurgent: b. Bayamo 18 April 1819; d. 22 March 1874. He studied at the University of Havana, and later at Barcelona, Spain. Implicated in Prim's conspiracy, he was banished from Spain (1843), and returned to Cuba to practise law. As leader of the revolt of 1868, he was chosen by the insurgents president of the newly proclaimed republic. He was killed in a skirmish with the Spaniards.

Cessart, Louis Alexandre de, *loo'ē ä-lëks-ändr dè cēs-sär*, French engineer: b. Paris 1719; d. 1806. He early entered the military service, and distinguished himself in the campaigns of 1743-6, during which he was present at the battles of Fontenoy and Rocoux. Bad health having obliged him to obtain his discharge, he entered the École des Ponts et Chaussées, where he displayed so much genius and industry, that in 1751 he was appointed general engineer of Tours. In 1775 he was removed to Rouen, and in 1781 proposed his plans for the construction of the harbor and works of Cherbourg. These have immortalized his name. He died while engaged in preparing a description of his most important labors. The work was published under the title of 'Description des Travaux Hydrauliques de L. A. Cessart' (1806-9).

Cessio Bonorum, *sësh'ī-ō bō-nō'rūm* ("surrender of goods"), a process by which, according to the law of Scotland, a debtor against whom a warrant of imprisonment was issued after being charged to pay his debt, was entitled to be free from imprisonment, if innocent of fraud, on surrendering his whole estate to his creditors. Since the abolition of imprisonment for debt a debtor may be compelled to make *cessio bonorum* at the instance of a creditor.

Ces'tius, the name of a plebeian gens at Rome, of which two memorials have been preserved, one of them a bridge connecting the island of the Tiber with the right bank of that river, and the other a monumental pyramid standing at the gate San Paolo, partly within and partly without the walls of Aurelian. This pyramid stands upon a base of travertine. It is 125 feet high, and at the base 95 feet broad. It is built of bricks, encased in blocks of marble. In its interior there is a sepulchral vault 20 feet long, 13 feet broad, and 14 feet high. The walls of this vault were formerly decorated with paintings, but these are now faded, and only a few traces of them are still discernible. Two marble pillars which formerly supported the statue of the person whom the monument commemorates, stand in front of the pyramid. From the inscriptions still seen upon it, it has been inferred that the Cestius who caused this magnificent monument to be erected was a Roman knight of that name who lived in the

CESTODA — CETACEA

time of Cicero, and who, having enriched himself in Asia Minor, left part of his wealth for the purpose of perpetuating his memory in this way.

Cesto'da, a class of the phylum *Platyhelminthes*, represented by the tape-worms (q.v.). They are parasitic, usually ribbon-like worms, without any mouth or digestive canal, but with a slightly developed nervous system and an (excretory) water-vascular system. They are hermaphrodite, the joints as a rule numerous and containing male and female reproductive organs; the eggs are minute and very numerous. The mature worm is many-jointed, the joints budding out from near the head; in this form it is called a "strobila"; the terminal joints fall off, becoming independent (proglottis). The eggs, after fertilization, pass through a morula and gastrula stage, a circle of six hooks and suckers developing on the head and forming the *scolex*, or organ of attachment. They live as parasites in birds, beasts, and man, their earlier stages being passed in the bodies of a different host, as fishes, etc.

The Cestoda are divided into five families: (1) *Caryophyllæidæ*; (2) *Ligulidæ*; (3) *Tetrarhynchidæ*; (4) *Tetraphyllidæ*; (5) *Bothrioccephalidæ*; (6) *Tæniadæ*, the last group being represented by the common tape-worm of man (*Tænia solium*). Consult: Leuckart, 'Die Menschlichen Parasiten,' two volumes; Braun, 'Die Tierischen Parasiten des Menschen; Linton, 'Notes on Entozoa of Marine Fishes of New England'; 'Reports of the United States Commission on Fish and Fisheries,' Parts I, II.; Stiles and Hassall, 'A Revision of the Adult Cestodes of Cattle, Sheep, and Allied Animals' (Bulletin 4 of the United States Department of Agriculture).

Cestracion, sēs-trā'sī-ōn, a genus of cartilaginous fishes allied to the sharks, of which the best known species is the Port Jackson shark of Australia (*C. philippi*). Four species are known, varying in length from four to five feet. They feed mainly on various kinds of mollusks. The family *Cestraciontidæ*, though now poorly represented, was very abundant in the earlier geological periods.

Ces'tus ("girdle"), a band or zone said to have been worn by Aphrodite or Venus, and endowed with the power of exciting love toward the wearer. The following is Pope's translation of Homer's description of it:

In it was every art and every charm
To win the wisest, and the coldest warm—
Fond love, the gentle vow, the gay desire,
The kind deceit, the still-reviving fire,
Persuasive speech, and more persuasive sighs,
Silence that spoke, and eloquence of eyes.

Cestus, or **Cæstus**, the boxing-glove of the Grecian and Roman pugilists. It consisted of thongs or bands of raw hide or leather, fastened to the hand, and reaching to the wrist. It was afterward enlarged so as to reach up to the elbow, and loaded with metal to increase the weight of the blow. The combat with the ordinary unloaded cestus was not more dangerous than a common modern boxing-match. Theocritus (Idyll. xxii.) and Vergil (*Æneid*, v. 362) describe one of these combats.

Cetacea, sē-tā'se-ä, an order of mammals whose structure is so modified as to render them

fit for an aquatic life. The whale-bone whales, the toothed whales, as the porpoise, narwhal, etc., and the extinct zeuglodon, represent the leading divisions of the group. The body is fishlike in form, the head passing gradually into the trunk which tapers posteriorly and ends in a bilobate caudal fin which is placed horizontally, not as in the fishes, vertically. The posterior limbs are wanting, and the anterior are converted into broad paddles or flippers, consisting of a continuous sheath of the thick integument, within which are present representatives of all the bones usually found in the fore limb of mammals, but they are not movably articulated, so that the paddle moves like a solid oar. The fish-like aspect is further increased by the presence of a dorsal fin; but this is a simple fold of integument, and does not contain, as in fishes, any bony spines. The vertebræ of the neck, seven in number, are united more or less to each other, so that in some they form a single solid piece. The right whale and its allies have no teeth in the adult state, their place being taken by the triangular plates of baleen or whalebone which are developed on transverse ridges of the palate. The frayed edges of these plates slope obliquely downward and outward from the middle of the roof of the mouth, so that when the mouth is shut there is a triangular space in the middle, the floor of which is formed by the enormous tongue. The water taken into the mouth is sifted by the frayed edges of the plates; it is driven out sideways between the plates and the tongue sweeps backward to the gullet any animals that have been caught in the fringes. But the fetal whales possess minute teeth, which are very soon lost. The porpoises, etc., when they possess teeth in one or both jaws, have them numerous and conical in form; they have no milk predecessors. The stomach is divided into several chambers, but these are not, as in ruminants, connected directly with the gullet; they are rather appendages of the pyloric portion of the organ.

The arrangement of the respiratory and circulatory systems, which enable the Cetacea to remain for some time under water, are interesting. The nostrils open directly upward on the top of the head, and are closed by valvular folds of integument which are under the control of the animal. When the animal comes to the surface to breathe it expels the air violently, and the vapor it contains becomes condensed into a cloud; if the expiration commences before the mouth of the spiracle or blow-hole is above the surface, a little water may be blown up like spray but no water from the mouth is thus discharged, for the soft palate firmly embraces during life the upper end of the larynx, so that the gullet is divided into two narrow passages, while the lungs have a continuous passage to the exterior. The blood vessels, especially those of the thorax and spinal canal, break up into extensive plexuses or networks, in which a large amount of oxygenated blood is delayed, and thus the animal is enabled to remain under water, the necessity for changing the air in the lungs being diminished.

Fossil Cetacea.—Bones of cetaceans, mostly allied to the living species, are found in the marine sediments of the Tertiary and Quaternary ages, and are occasionally dredged up from deep-sea deposits. The hard and heavy ear-

CETEWAYO — CEVALLOS

bones are especially apt to be preserved as fossils. The zeuglodons and squalodons of the Eocene epoch represent a peculiar primitive group of cetaceans with two-rooted teeth. Very little is known of the evolution of this order of mammals.

Classification of Cetacea.—The sub-orders of cetacea are as follows:

1. *Mystacoceti*, baleen-bearing whales. Its families are: *Balænopteridæ*, rorquals, and other great whalebone whales; *Balænidæ*, right whales and kogias.

2. *Odontoceti*, of which the families are: *Physeteridæ*, sperm-whales (*Physeterinæ*), and beaked whales (*Ziphiinæ*); *Delphinidæ*, dolphins, porpoises, white whales, killers and the like; *Platanistidæ*, river dolphins; and the extinct *Squalodontidæ*.

3. *Archæoceti*, containing the extinct family *Zeuglodontidæ*. The most recent and important work on this order is Beddard's 'Book of Whales' (London 1900). See WHALE, and the names of the various groups and species of cetaceans.

Cetewayo, sēt-ī-wā'yō, Kaffir chief or king, son of Panda, king of the Zulus: d. Ekowe 8 Feb. 1884. Disturbances as to the succession having arisen in Zululand, Shepstone, the representative of the Natal government, secured the recognition of Cetewayo as king in 1873. The latter, however, in spite of the obligations into which he had entered, proved a tyrannical ruler, and maintained a large army. A dispute which had arisen regarding lands on the frontier was settled by arbitration in favor of the Zulus; but on the refusal of Cetewayo to comply with the conditions imposed, war was declared against him by the British, and the king made prisoner soon after the battle of Ulundi, July 1879. In 1882 he visited England and was conditionally restored to part of his dominions. In the following year he was driven from power by the chief Usibepu, and remained under the protection of the British until his death.

Cethe'gus, Gai'us Corne'lius, Roman statesman, one of the associates of Catiline. He was put to death in prison by order of the senate, at the instigation of Cicero, 68 B.C.

Cetinje. See CETTIGNE.

Cetiosaurus, sēt-ī-ō-sā'rūs, a genus of amphibious dinosaurs (see DINOSAURIA), of which fragmentary remains have been found in the Lower Cretaceous (Wealden) of Europe.

Cette, sēt, France, a seaport town in the department of Hérault, built on a neck of land between the lagoon of Thau and the Mediterranean, 23 miles southwest of Montpellier. The space enclosed by the piers and breakwater forming the harbor can accommodate about 400 vessels; and the harbor is defended by forts St. Pierre and St. Louis. A broad, deep canal, lined with excellent quays, connects the port with the Lake of Thau, and so with the Canal du Midi and the Rhone, thus giving to Cette an extensive inland traffic; and it has an active foreign commerce. The principal trade is in wine, brandy, salt, dried fruits, fish, dyestuffs, perfumery, and verdigris. Cette has shipyards, salt-works, glass-works, factories for the manufacture of syrups and grape sugar, etc., and carries on extensive fisheries. After Marseilles,

it is the principal trading port in the south of France; and it is much resorted to as a watering place. Pop. (1901) 33,065.

Cettigne, tsēt-tīn'yě, or **Cetinje**, chēt tēn'yā, Montenegro, the capital of the principality; situated in a lofty mountain valley, 19 miles east of Cattaro. It contains the palace of the ruler and the government buildings, a convent founded in 1478, a girls' institute and other schools, an arsenal, and a theatre. Turkish invaders sacked and burnt the town in 1683, 1714, and 1785. Many famous Montenegrin rulers lie buried here. Pop. about 3,500.

Ce'tus (Lat. whale), a large constellation lying on both sides of the equator, but mostly south of it, one of Ptolemy's original 48. It is surrounded by Pisces, Aries, Taurus, Eridanus, Fornax, Sculptor, and Aquarius. It contains the remarkable variable star Omicron Ceti, or Mira.

Cetyl, sē'tīl, an alcoholic radical not yet thoroughly isolated, but supposed to exist in a series of compounds obtained from spermaceti.

Ceuta, thā'oo tā, Morocco, a strongly fortified place belonging to Spain, on the coast of Africa, opposite Gibraltar. The town occupies the site of the Roman colony of *Ad Septem Fratres*, so called from the seven hills rising here in a group, of which the most prominent are Montes Almina and Hacho; on the latter, the ancient Abyla (one of the Pillars of Hercules), is a strong fort, and on the former, among beautiful gardens, lies the New Town. Ceuta contains a cathedral, a hospital, and convents, but is chiefly of importance as a military and penal station. The place was a flourishing mart under the Arabs, and there the first paper manufactory in the Western world is said to have been established by an Arab who had brought the industry from China. In 1415 it was captured and annexed by the Portuguese, and fell to Spain in 1580. It has resisted several sieges by the Moors (1694-1720 and 1732), and is still the most important of the four African presidios. Pop. about 14,000.

Ceva, Tommaso, tōm-mā'sō chā'vä, Italian mathematician and poet: b. Milan 20 Dec. 1648; d. 3 Feb. 1736. He was admitted into the order of Jesuits in 1663, and spent his life as an instructor in various colleges. His more important mathematical works had reference to angles, for the trisection of which he invented a mechanical instrument. He wrote several biographies in Italian, and many poems in Latin and Italian, two of which, entitled 'Philosophia novantiqua'; and 'Puer Jesus', are still admired.

Cevallos, Pedro, pā'drō thā-väl'lōs, Spanish diplomatist: b. Santander, Biscay, 1761; d. Seville 29 May 1838. He studied at Valladolid, and entered on a diplomatic career. Having been appointed secretary to the embassy at Lisbon, he there married a niece of Manuel Godoy, Duke of Alcudia, the Prince of Peace, and became afterward minister of foreign affairs. In the disputes between Charles IV. and his son Ferdinand he adhered to the latter. Aware of the influence which Cevallos possessed over the Spanish people, Joseph Bonaparte was anxious to gain him over, and offered to take him into his service. Cevallos accepted with apparent willingness, but on arriving at Madrid



Fig. 1 Skull of Camel. 2 Llama. 3 Giraffe. 4 Skull of do. 5 Manatee. 6 Skull of Dugong. 7 Dolphin. 8 Skull of do. 9 Narwhal. 10 Skull of Sperm Whale or Cachalot. 11 Greenland or Right Whale. 12 Skull of do. 13 Finner Whale. 14 Short-tailed Manis. 15 Ant-eater. 16 Skull of do. 17 Common Armadillo. 18 Skull of do. 19 Skull of Sleth.

CEVALLOS — CEYLON

united with the Spanish junta against Joseph, and was sent by them on a mission to London, where in 1808 he published his celebrated work on Spanish affairs, referring more especially to the proceedings at Bayonne. After the Restoration he for some time maintained a great influence over Ferdinand, but on his opposing the marriage of the latter with a princess of Portugal he lost favor, was deprived of his office of secretary of state, and sent as ambassador to Naples and Vienna. On being recalled in 1820 he retired to private life.

Cevallos, Pedro Fermin, Ecuadorian lawyer and historian: b. Ambato about 1814. Besides holding several high professional positions he was a senator in 1867. His principal work is: 'Resumen de las historia del Ecuador,' in five volumes.

Cévennes, sā-vĕn, France, a southern district, which at one time formed the northern part of the government of Languedoc. During the wars against the Albigenses its mountains and valleys were the asylum of numerous persons who had renounced many of the beliefs of the Roman Catholic Church. It now forms part of departments Haute-Loire, Loire, Ardèche, Gard, and Aveyron.

Cévennes, sev-en' (ancient CEBENNA), the chief mountain range in the south of France. With its continuations and offsets, it forms the watershed between the river systems of the Rhone and the Loire and Garonne. Its general direction is from northeast to southwest, beginning at the southern extremity of the Lyonnais Mountains, and extending under different local names as far as the Canal du Midi, which divides it from the northern slopes of the Pyrenees. The Cévennes extend for over 150 miles, through or into nine departments, the central mass lying in Lozère and Ardèche, where Mount Lozère attains 5,584 feet, and Mount Mézen (the culminating point of the chain) 5,754 feet. The average height is from 3,000 to 4,000 feet. The mountains consist chiefly of Primary rocks, covered with Tertiary formations, which in many places are interrupted by volcanic rocks.

Ceylon (native SINGHALA, ancient TAPROBANE, an island possession and crown colony of Great Britain, in the Indian Ocean, about 60 miles southeast of the southern extremity of Hindustan, from which it is separated by the Gulf of Manaar and Palk Strait. It lies between lat. 5° 56' and 9° 50' N., and between lon. 80° and 82° E., having the shape of a pear, with the broad end south. Length, about 270 miles north to south; average breadth, 100 miles; area, 25,364 square miles. The northern and northwestern coasts are flat and monotonous, those on the south and east bold and rocky, presenting a highly picturesque appearance, which is further heightened by the exuberant vegetation, the noble palm forests, the luxuriant corn fields, and the verdant slopes of the mountains enameled with bright flowers, herbs, and creeping plants, whose delicious perfume spreads far and wide. Many parts of the coast, at its southern and northern extremities are studded with small, rocky, and verdant islands, some of them overgrown with palms, and presenting a singularly beautiful appearance. At Trincomalee, on the northeastern coast, there is one of

the finest natural harbors in the world; at Galle on the southern coast there is also a harbor; while the harbor at Colombo, the capital, is capable of admitting the largest vessels, and is now the regular calling-station for mail steamers to and from Calcutta, China, and Australia. Between the islands of Manaar on the northwestern coast of Ceylon and the island of Ramiseram on the coast of India, is a ridge of sandbanks called Adam's Bridge, which nearly connects Ceylon with the continent, being intersected only by three narrow shallow passages, the remainder being covered with two or three feet of water at full tide. These channels admit only very small vessels, but ships of some size can get through between Ramiseram and the mainland; and schemes for the passage of larger vessels have been projected, as also for a railroad along Adam's Bridge.

Mountains.—The mountainous regions of Ceylon are confined to the centre of the south and broader part of the island. They gradually diminish to hills of moderate elevation as they recede from the central mass, and are succeeded on the western side by a flat tract extending to the coast. Their average elevation is somewhere about 2,000 feet, but there are several summits upward of 7,000 and 8,000 feet high. The highest summit is Pedrotallagalla (8,260), but Adam's Peak, reaching 7,420 feet, is the most remarkable from its conical form, the distance from which it is visible from the sea, and from the sacred associations with which it is connected, the summit being the point from which Buddha, according to his followers, ascended to heaven, a gigantic footprint bearing testimony to the fact. Other summits are Tolapella (7,720) and Kirrigalpota (7,810). The forms of the mountains of Ceylon are singularly varied. They most frequently occur connected in chains, and terminate in round or peaked summits. Their sides are always steep and occasionally precipitous and rocky. There is no proportional correspondence between the heights of the mountains and the depths of the adjoining valleys, and often the valleys are extremely narrow. The deepest are in the heart of the mountains. Some are between 3,000 and 4,000 feet deep, and not over half a mile wide.

Rivers and Lakes.—The rivers of Ceylon, though numerous, especially on the southern and southwestern sides, are small, being merely mountain streams, navigable only by canoes, and that but for a short distance from their mouths. The Mahaveli-ganga, which rises near Adam's Peak, and falls into the sea by a number of branches near Trincomalee, is by far the most important. It has a course of 134 miles, and drains upward of 4,000 square miles. Timber grows on its banks in great abundance, consisting of halmalille, ebony, satin-wood, etc., which is floated down to the harbor during the freshets. Of the remaining rivers the Kalaniganga, the Kala-ganga, and the Maha Oya reach the sea on the western coast; and the Gintota-ganga at Galle. All the rivers are liable to be surcharged with rain during the monsoon, and to inundate the level country, while the heat of the sun on drying the country produces malaria. There are numerous extensive lagoons or back-waters round the coasts, but no lakes in the island worth noticing, the largest being only four miles broad. There are rills and streamlets rushing along in every direction among the mountains,

CEYLON

so overhung with superabundant vegetation as to be frequently invisible.

Geology and Mineralogy.—Ceylon is mostly formed of ancient stratified rocks, but owing to the obliteration of fossil remains it is doubtful whether they have been deposited on the beds of seas or lakes. The mountains are composed of Primary and metamorphic rocks, the prevailing rock on the island being gneiss, though laterite (or "cabook") and a sort of dolomite also occur in considerable quantity. In the Nuwara-Eliya district and elsewhere there are large alluvial tracts. Basalt is found near Galle and Trincomalee, and at Pettigallakanda an ancient lava occurs. The soil is mostly formed from the disintegration of gneiss. The western coast of the island is believed to be rising. Plumbago is found in sufficient quantities to make it of commercial importance, anthracite is obtained, and among the metals occurring in the island are iron in fair quantity, manganese, gold, platinum, molybdenum, nickel, cobalt, copper, and tin. No coal has been found, but nitre and salt occur (the latter is also a somewhat important article of manufacture). Gems of many kinds are abundant, particularly near Ratnapura. They are found either embedded in the rock or washed down in the alluvium of river-beds, and include zircons, amethysts, cat's-eyes, topazes, moonstones, garnets, spinel, sapphires, rubies, cinnamon stones, etc. There are hot springs at Bintenna, Trincomalee, and Puttalam.

Roads and Transportation.—Ceylon is now well provided with roads. A highway has been made from Colombo to Nuwara-Eliya, 6,000 feet above the level of the sea. A continuous line, 769 miles in length, makes the entire circuit of the coast, and every town of importance is connected by roads with the two chief cities. The roads in general are good, many of them being macadamized, and in the neighborhood of the chief towns are adapted for carriages. During the monsoons, however, the roads in many parts are impassable from inundations. The building and maintenance of roads, bridges, streets, and canals forms one of the chief items of expenditure of the government. Railroad extension is also a government affair, and there are now about 300 miles in all, the main line being that between Colombo and Kandy (75 miles). In the early part of the 19th century there was not a single road in the country, merely a few pathways, the greater part of the island being then covered with impenetrable forests.

Climate.—Where the jungle has been cleared away and the land drained and cultivated, the country is perfectly healthy; where low wooded tracts, and flat marshy lands abound, covered with a rank, luxuriant vegetation, the climate is eminently insalubrious, showing, what is now pretty well understood, that mere heat has little to do with the unhealthiness of tropical climates. The heat is not so great as on the neighboring coast of India, the sea-breezes moderating the temperature. At Colombo, on the western side of the island, near the seventh parallel of north latitude, the mean daily variation of the temperature does not exceed 3°, and the annual range is from 76° to 86° 30' F. At Nuwara-Eliya (6,000 feet high) the annual range is from 32° to 80°. The eastern part of the island, being exposed to the northeastern monsoon, has a hot and dry climate, resembling that of the coast of Coromandel; while the

western division, being open to the southwestern monsoon, has a temperature and humid climate like that of the Malabar coast. The quantity of rain that falls annually in Ceylon is estimated at three times the quantity that falls in England, the rains being less frequent, but much heavier. The interruption which the course of the monsoons meet with from the mountain ranges of the island causes deluges of rain to fall on one side, while the other is parched with drought. At Kandy, in the interior, the average annual fall of rain is 85.3 inches; at Colombo, on the seacoast, 75 to 80 inches. The prevalent diseases are those of the liver and intestines, often accompanied by fever. Elephantiasis and other cutaneous complaints are common. The very fatal disease called beriberi (*Hydrops asthmaticus*) occasionally occurs, being almost peculiar to the island.

Animals.—Most of the animals found on the opposite continent are native to this island, excepting the royal tiger, which does not exist here. Elephants are numerous, especially in the northern and eastern provinces, where they sometimes do great injury to the growing crops. The elephants of Ceylon are esteemed for their superior strength and docility. The eagerness with which they are hunted has greatly diminished their numbers. Since 1869 licenses for the capture and exportation of elephants must be obtained from the government. Bears, buffaloes, leopards, jackals, monkeys, and wild hogs, are numerous. There are several species of deer, of which the elk and fallow deer (properly the great red Sambar and spotted axis) are most abundant. Porcupines, bandicoots, squirrels (flying and other), bats, mungooses, are to be found, as are also the pangolin or scaly anteater, and the loris or Ceylon sloth. Flying-foxes and rats are numerous. Pheasants, snipes, partridges, pigeons, peacocks, and a great variety of birds, of splendid plumage, are plentiful. Crocodiles, serpents, and reptiles of all sorts abound. Of the snake tribe, consisting of about 26 different species, six only are venomous. Among the insects are the leaf and stick insects, the ant-lion, the white ant, etc.

Vegetable Products.—In the luxuriance of its vegetable productions, Ceylon rivals the islands of the Indian Archipelago, and in some respects bears a strong resemblance to them; its most valuable products are tea, rice, coffee, cinnamon, and the cocoanut. Coffee used to be the chief cultivated crop, but disease has within recent years much reduced the product. Cinnamon grows in the southwest, to which it is almost exclusively confined, requiring a sandy soil with a moist atmosphere. The trade in this spice was reserved as a government monopoly by the Dutch when they had possession of the island; all that was collected beyond the quantity which it was thought could be sold at a monopoly price being burned. This absurd system was followed by the English for some years after their conquest of Ceylon, but was abandoned in October 1832, when the trade in cinnamon was declared free, subject to a duty on exportation. The cocoanut-trees grow along the entire western and southern coasts in countless numbers, each tree producing from 50 to 100 nuts in the year. Every part of this invaluable tree is capable of being turned to profitable account. The Palmyra palm, which grows principally in the northern part of the island, is of

CEYLON

hardly less importance than the cocoanut, being productive in seasons of drought, when the crops fail. The jaggery palm, or kittul-tree, is cultivated for the sake of its sap, which yields a coarse sugar; its pith furnishes a kind of sago; and its fruit is also eaten. The talipot palm also abounds, as do the jack- and breadfruit-trees, the fruit of which is used by the natives for food, both raw and cooked; the timber, also, of the jack-tree, not being subject to be attacked by the white ant, is much used by the natives for making furniture, and in house-building. The Ceylon areca nut, celebrated for its superior qualities, is exported in large quantities. Tobacco is raised principally in the northern district, and is of excellent quality. Indigo grows wild, but is not sought after. The cardamom plant is abundant, but inferior to that of Malabar; fruits and culinary vegetables are produced, the latter in the elevated districts, in great variety and profusion. The island abounds with timber of various descriptions, including calamander, satin, rose, sapan, iron, jack, halmalille, and other beautiful woods adapted for cabinet work. Agriculture generally, and the cultivation of the more valuable native products of the island in particular, are improving. As already stated, coffee once was the chief crop, but latterly the cultivation of tea, cinchona, and cacao has been carried to such an extent that the island has become less dependent on a single article of produce. Notwithstanding the acknowledged fertility of Ceylon, the capabilities of its soil where justice is done to it, and the efforts now in progress to develop these capabilities, by far the largest proportion of the island is still uncultivated. There are a few natives who possess considerable estates in land; but the law of inheritance has, for the most part, caused a minute subdivision of the soil, to a degree very unfavorable to its improvement. The British government claims the proprietorship of all the waste lands, which are now disposed of by public sale. Among works carried on by the government are irrigation works in suitable localities, including the cutting of channels, the construction of annicuts or dams, and the formation and repair of tanks. Some of the ancient works of this kind are of great magnitude. There is also a government forest department, part of the work of which is to provide fuel for the railroads and timber for government works

Pearl-fishery, etc.—There has long been a pearl-fishery on the coast of Ceylon, carried on as a government monopoly. The fishery sometimes fails for years, there having been none, for instance, between 1837 and 1854, or between 1863 and 1874. Although the government still continued a strict surveillance over the banks, and occasionally subjected them to a careful examination, scarcely any trace of the pearl oyster was to be found. No cause has yet been discovered for this disappearance. When the pearl-fishery is in existence it is confined to the Gulf of Manaar, where the oyster banks extend for 60 or 70 miles along the coast south of Manaar, and perhaps 10,000 people, including 2,500 divers, will assemble in the fishing season. The Ceylon pearls are whiter than those of Ormuz or the Arabian coast. The chank or conch fishery was at one time carried on to a great extent, employing about 600 divers, but has greatly declined owing to the little demand

now made for them in Bengal, to which the greater part were sent. The chank is a sea-shell (*Voluta pyrum*), adapted for cutting into rings, these being formerly used in great numbers by the native women of Hindustan for bracelets and anklets.

Manufactures and Trade.—The manufactures of Ceylon are very unimportant with exception of arrack, which is distilled from the juice of the cocoanut-tree. The spinning and weaving of cotton goods, generally of the coarsest kind, was at one time a considerable industry, but is now dying out. There are numerous oil-mills for pressing the cocoanut kernels to express the oil. The Singhalese make good artisans, as is experienced at Colombo, where they are employed in making steam engines and other machinery. They are skilful in carpentry and wood-work, expert workers in gold and silver, and excel in the manufacture of lacquered ware. Salt is a government monopoly, being collected from shallow lagoons, which at certain seasons are overflowed by the sea, or it is manufactured in pans, the property of the government. The exports are chiefly tea, coffee, cinchona, cinnamon, cocoanut products, areca nuts, cacao, cardamoms, plumbago, tobacco. Tea has only begun to be exported in recent years, and the export has increased from 2,392,975 pounds in 1884, to more than 130,000,000 pounds. The total value of exports in 1899 was about \$56,000,000; of the imports about \$51,000,000. The trade of Ceylon is chiefly carried on with Great Britain and India, the former of which received from the island in 1899 goods approximating in value to \$26,000,000, and sent thither goods to the value of over \$7,000,000. The chief article exported to Great Britain is tea, the value of which in 1899 reached nearly \$19,000,000. The only other exports thither worth mention are coffee, cocoanut oil, and plumbago. The principal articles of import from Great Britain are coal, cotton manufactures, apparel and haberdashery, iron and steel manufactures, machinery, etc. The value of imports from Great Britain of manufactured cotton goods in 1899 was \$1,138,000; of wrought and unwrought iron, \$700,000; of coal, \$975,000. From other countries are imported rice, dried fish, wheat, sugar, and various other commodities.

Government, etc.—The government of Ceylon is conducted by a governor and two councils, executive and legislative, of both of which the governor is president. The first is composed of 6 members, including the governor; the other of 17 members, including the members of the Executive Council, 4 other office-holders, and 8 unofficial members selected by the governor as representative of the different classes and interests in the community. The powers of the councils are limited, being wholly subservient to the governor, who can carry into effect any law without their concurrence. All laws must be approved of by the secretary of state for the colonies before they can take effect. Any individual properly qualified may be appointed to the most responsible situation, without reference to service, nation, or religion, and native Singhalese have occupied some of the highest posts. The island is divided into nine provinces—the Eastern, Western, Northern, Southern, Central, North Central, Northwestern, Sabaragamuwa, and Uva, and subdivided into districts. In each province is stationed a government agent. For

CEYLON

the administration of justice there are in the civil and criminal departments a supreme court, established at Colombo; also a vice-admiralty court, and provincial courts, stationed in various districts; besides magistracies. There are municipalities or local boards in the towns, and there are also native village councils. The chief sources of revenue are the customs duties, railroad receipts, land rents, and salt farms. The chief articles of export are now free. The revenue for 1898 amounted to \$12,600,000; expenditure, \$11,400,000. The public debt amounts to about \$17,300,000; but the finances are in a very healthy condition, as the public debt of the colony has been mostly incurred for the construction of railroads.

People.—The present population of Ceylon is composed of Singhalese, Cingalese, or Ceylonese, descendants of immigrants from Hindustan who entered the country in the 6th century B.C., Malabars or Tamils, originally from southern India, Moors, Malays, Veddahs, and a small proportion of Europeans and their descendants. The Singhalese inhabiting the coasts are a mild, timid race, obsequious to strangers, and hospitable and humane. Their stature is rather below the middle size; their limbs slender, but well shaped; eyes dark, finely cut features, hair long, smooth, and black, turned up and fixed with a tortoise-shell comb on the top of the head; color varying from brown to black, or rather from the lightest to the darkest tints of bronze. The Singhalese of the interior, or Kandian Singhalese, are a superior race, being stouter, handsomer, and of more manly and independent bearing, with a greater degree of intelligence. The Malabars of Ceylon are similar in all respects to those of the continent. The Mohammedans or Moors are an energetic and industrious people, and engross a large proportion of the commerce and traffic of the island. The Veddahs, a savage race, are supposed to be a portion of the aboriginal inhabitants of Ceylon. They inhabit the most secluded and inaccessible parts of the island, and subsist entirely on wild fruits and animals. A cloth round the loins is their only clothing; and their habitations, generally of small dimensions, are formed for security among the branches of large forest trees. They are a robust and hardy race, but extremely peaceable and inoffensive. The other inhabitants of the coast consist of Dutch, Portuguese, and English; some Malays or natives of the Eastern Archipelago, a few Chinese and Parsee traders, and a various population sprung from the intermixture of these races with each other. The descendants of the Dutch and other Europeans are known as burghers. The population is rapidly increasing. In 1832 it scarcely amounted to 1,000,000; while in 1881 it was 2,750,000. In 1901 the total was 3,576,990, including 2,334,817 Singhalese, 952,237 Tamils, 224,719 Moormen, and 9,583 Europeans. The increase is partly to be attributed to the number of coolies who come from India for employment on the plantations.

Religion, Language, Education.—More than half the population are said to be Buddhists, and about 500,000 are of the Hindu religion. Buddhism chiefly prevails in the interior, and generally among the Singhalese of the sea-coasts. It is maintained and protected by the British government, agreeably to the treaty of 1815. On the western and southwestern coasts

numbers of the Singhalese profess the Roman Catholic religion. There are a number of Episcopal clergy in the island, subordinate to the bishop of Colombo; various other Protestant bodies have places of worship, but the Protestants are less than half the number of the Roman Catholics. The Singhalese have a colloquial language peculiar to themselves, but their classic and sacred writings are either in Pali or Sanskrit. The Malabars use the Tamil. English is becoming more and more common, "and there is scarcely a roadside village in Ceylon now where the traveler could not find some persons to speak English, or interpret for him." The government has a department of public instruction, and good progress is being made in education throughout the island. On 1 Jan. 1891, there were 146,500 children participating in public instruction, a number of the schools being maintained or aided by the government. There are schools maintained also by the Church Missionary Society, by the Wesleyan, the American, and the Baptist Missionary societies, besides a number of private and some regimental schools.

Antiquities, History, etc.—The Singhalese annals contain a historical record of events for 24 centuries; and their authenticity, as regards description of ancient towns and buildings, and other works of art, is established by existing ruins, proving that the island had been, at a remote period, inhabited by a powerful and numerous people. The ancient capital, Anuradhapura, and its neighborhood contain many interesting and splendid relics of the ancient Singhalese civilization. Chosen as the capital in 437 B.C., it received fully a century later various relics of Guatama Buddha, and to contain these as well as other sacred articles many temples were erected. In the 1st century of our era the city occupied an area of 256 square miles, enclosed by 64 miles of walls. A remnant of the celebrated bo-tree, said to have sprung from that under which Gautama sat at the time when he became a Buddha, is still seen enclosed in the court of a temple. Here, too, is the so-called Brazen Palace, originally built in 142 B.C., and consisting of 40 rows of 40 pillars each. Dagobas, or shrines containing relics of Buddha, are very numerous. They are of brick, incrusting with a special preparation which takes on a fine white polish. One of the finest of these monuments is the Ruwanwelisaye, built about 140 B.C.; but the most beautiful of Ceylonese dagobas is the Toopharamaya, with many finely sculptured columns. Jaitawanaramaya, originally 315 feet in height, is now 269 feet high, and, like most of the ruins of the island, is overgrown by trees and brush-wood. Among the most curious and notable of the ancient relics which invest Anuradhapura with such profound interest are the numerous tanks constructed at various dates between 200 B.C. and 300 A.D., and in the 12th century. Some of these are of enormous size, and several have been restored and applied to their original purpose of irrigation. From the 8th to the 13th century the capital was Pollanarrua, now Topare, near which also are found many splendid ruins, including a fine rock temple. At Dambula, there is a celebrated cave temple, dating from the 1st century B.C.

Ceylon was known to the Greeks as Taprobane. In 543 B.C. it was conquered by Vijaya, a prince from the mainland of India, and for

CEYLON MOSS — CHABLAIS

several centuries the island enjoyed great prosperity under the generally beneficent rule of his dynasty. The Hindu incomers brought with them the civilization of their own country, and great part of Ceylon became covered with towns and villages. Several of Vijaya's successors had to contend with invading Malabars, and these ultimately secured the sovereignty. A restoration of the line of Vijaya in the 11th and 12th centuries contributed to the return of something of the ancient grandeur of the island. Little was known regarding it in Europe until 1505, when the Portuguese established a regular intercourse with Ceylon, being encouraged thereto by a native king. The Portuguese were subsequently expelled by the Dutch in 1658, after a stubborn struggle of 20 years' duration. The Dutch soon opened up an extensive and profitable trade with Holland, and they constructed several canals to serve as means of communication between their various posts on the island. Their policy, however, though beneficial on the whole to the Singhalese as well as themselves, was essentially a selfish and exclusive one. British intercourse with the island began in 1763, and in 1795, owing to the war with France and Holland, Great Britain was induced to attempt an effective occupation of it. In that year Trincomalee, and in the following year Colombo, was captured; and by these victories all the Dutch forts were transferred to Great Britain. By the peace of Amiens (1802) the whole coast territory was formally ceded. The king of Kandy, who remained in possession of the central mountainous region, perpetrated such atrocities on his own people that many of their chiefs in 1815 entreated Great Britain to depose him. A short campaign was ended by the capture of the tyrant and his deportation as a prisoner to India, and since then the whole island has been under direct British rule. A serious rebellion in 1817 and minor ones in 1843 and 1848 have been the only breaks in the generally tranquil subsequent history of the colony. British rule has contributed very largely to the material advancement of the island by the construction of roads and railways, the extension of the Dutch canal system, the restoration of irrigation tanks, the bridging of rivers, and the development of its great natural resources. Two important events in its modern history have been the rise and decline of coffee-planting (say from 1837 onward, and the substitution of tea-planting (about 1878) in its place. The decline of coffee-planting, as is well known, has been caused by a leaf-fungus. The planting of cinchona, cacao, and rubber-trees has also helped to add to the resources of Ceylon in recent times. In 1901 a considerable number of Boers, captured by the British in the South African war (q.v.), were sent to Ceylon.

The principal towns of the island are Colombo, Trincomalee, Kandy, Galle, Jaffna, and Kornegalle.

Chapu, chā-poo' or shā-poo', or **Chapoo**, China, a seaport town in the province of Cheh-Chiang (or Che-Kiang), on the north side of Hang-Chau Bay, 35 miles from Ning-Po. Although not a treaty port, it carries on a considerable commerce with Japan. Its European trade is conducted through the treaty port of Ning-Po, and is largely in green tea. Its im-

ports are ginseng (from the United States), and manufactured goods. The native industries are sedge hats and mats, fishing, and silk-making. Merchant vessels do not touch at Chapu ordinarily, although Chinese and Japanese junks put in regularly. Pop. about 80,000.

Chabaneau, Camille, kā-mēl shā-bā-nō, French philologist: b. Nontron 4 March 1831. Since 1879 he has been professor of romance languages at Montpellier. He has written 'Histoire et Theorie de la conjugaison Française' (1868); 'Grammaire Limousine' (1876); 'La Langue et Littérature Provençales' (1879); 'Biographies des Troubadours' (1885); and has contributed largely to the 'Revue des Langues Romanes.'

Chabas, François, frān swā shā-bā, French Egyptologist: b. Briancourt 2 Jan. 1817; d. Versailles 17 May 1882. Though at first engaged in commerce, he found time to become a learned linguist, but it was not till 1851 that he gave himself up to the study of hieroglyphics. The first results of his studies appeared in 1856, followed by a series of invaluable books and papers, elucidative chiefly of two important periods of ancient Egyptian history—the conquest of the country by the Hyksos, and the time of their expulsion. Among the more important of his many books are 'The Shepherds in Egypt'; 'History of the 19th Dynasty and especially of the Period of the Exodus'; and 'Studies of Historical Antiquity from Egyptian Sources.' From 1873 to 1877 he edited 'L'Egyptologie.'

Chabazite, a member of the zeolite family of minerals of variable composition, but in general definable as a hydrated silicate of aluminum, calcium, and sodium, with small amounts of potassium, and occasionally of barium and strontium. It has a hardness of from 4 to 5, and a specific gravity of about 2.1. It is transparent or translucent, and varies in color from white to pale red or yellow. It occurs in rhombohedral crystals that are sometimes barely distinguishable from cubes, and also in amorphous forms. It is widely distributed, and usually occurs in connection with basalt, syenite, gneiss, or mica, or hornblende schist.

Chabert de Cogolin, Joseph Bernard, zhō-zēf bār-nār shā-bār dé kō-gō-lān, MARQUIS, French geographer: b. Toulon 28 Feb. 1724; d. 1 Dec. 1805. He entered the marines as a cadet in 1741. In 1750 he sailed to the North American coast, and on his return published the result of his observations in an astronomical and hydrographical work, entitled, 'Voyage sur les Côtes de l'Amérique Septentrionale' (1753). In 1758 he was chosen a member of the Academy. In the American war Chabert distinguished himself so highly that in 1781 he was made commander of a squadron. In 1792 he was made vice-admiral. During the same year the Revolution drove him to England. In 1800 he lost his sight in consequence of his intense application to study, and in 1802 returned to Paris, where Bonaparte assigned him a pension. In 1804 he was appointed a member of the Bureau des Longitudes, and in 1805 presented to it a map of Greece and a description of the coasts of that country.

Chablais, shā-blā, France, a district in Savoy, south of the Lake of Geneva. At one time it formed part of the kingdom of Bur-

CHABLIS — CHACMA

gundy, but in the 11th century came into the possession of the counts of Savoy. In 1860 it was ceded to France, along with the rest of Savoy, by Victor Emmanuel, king of Sardinia. It now forms the arrondissement of Thonon (its ancient capital), in the department of Haute-Savoie.

Chablis, shä blē, France, a town in the department of Yonne, on the left bank of the Serein, 11 miles east of Auxerre. It stands in the midst of vineyards which produce the celebrated white wine known by its name. The annual product is about 4,400,000 gallons, but the quantity sold over the world as Chablis is much greater. Pop. 2,400.

Chabot, François, frän-swä shä-bō, French revolutionist: b. Saint Geniez, France, 1759; d. Paris 5 April 1794. In early life he entered the Capuchin order. The treatises of casuistry which he perused in order to prepare him for the confessional he claimed to have corrupted his morals, and on the suppression of the monasteries, though still professing to be a priest, he gave himself up to the most scandalous excesses. The Bishop of Blois nominated him his vicar-general, and succeeded in getting him chosen deputy to the national convention for the department of Loire-et-Cher. In this capacity he displayed the bitterest animosity against the king and his ministers, and all deputies friendly to moderate courses; and labored incessantly to overturn the throne. On the night of 10 Aug. 1792, he preached in a church of the Faubourg St. Antoine, and urged the most violent incitements to insurrection; though on the following day he is said to have saved some priests and the Abbé Sicard, the celebrated teacher of the deaf and dumb, from the fury of the populace. His party, from occupying the higher seats of the national convention, were designated by the name of the Mountain, which they have since retained. The conversion of the cathedral of Nôtre Dame into the Temple of Reason is said to have originated with Chabot. He at last became suspected by his party, chiefly in consequence of his marriage with a young and beautiful Austrian, and the favoritism he displayed toward his two brothers-in-law, who were striving to enrich themselves in the general disorder. Along with several other deputies he was accused of having appropriated the effects of the former East India Company, and vainly tried to save himself by reminding Robespierre of the services he had rendered him. When he saw that he was lost he swallowed poison, but suffered such excruciating pains that he took an antidote to remove them. Three days after he was guillotined. His brothers-in-law shared his fate.

Chabot, Philippe de, fē-lēp dē, French general: b. about 1480; d. 1 June 1543. Having bravely defended Marseilles in 1524, he was made prisoner at Pavia in 1525. Appointed admiral immediately after his release, he was sent to Italy in 1529 to negotiate the ratification of the treaty of Cambrai by Charles V. Made commander-in-chief of the forces in Savoy in 1535, he effected the conquest of part of that country and of Piedmont, but was censured for not following up his victory. On his return to France charges of frauds upon the national treasury were

brought against him. Found guilty and imprisoned, he was soon afterward pardoned by the king at the urgent solicitation of the duchess d'Étampes, and reinstated in his position. He is said to have been the first to suggest the project of colonizing Canada.

Chabrias, kā'brī-ās, Athenian general. In 392 he succeeded Iphicrates in the command of the Athenian forces before Corinth, was afterward sent to chastise the Æginetes for depredations on the coast of Attica, and assisted Evagoras in Cyprus, and Acoris in Egypt, against the Persians. In 378 he commanded the army which the Athenians sent to the aid of Thebes against the Lacedæmonians, under Agesilaus, on which occasion he saved his troops from impending defeat by a military manœuvre renowned in antiquity, commanding them to await the attack of the enemy with pointed spear and shield, resting on one knee. In 376 he won an important victory over the Lacedæmonian fleet off Naxos. The Athenians having abandoned the alliance of Thebes, he defended Corinth against Epaminondas. He took part in the expedition against Thrace at the outbreak of the so-called social war. At the siege of Chios his vessel was the first to enter the harbor, but becoming isolated and disabled was soon abandoned; he alone refused to save his life, and fell fighting, 357 B.C. He was the last of the great Athenian generals. Demosthenes said that he conquered 17 cities, took 70 vessels, made 3,000 prisoners, and enriched the treasury of Athens with 110 talents. One of his apothegms, for which he was celebrated, was that an army of stags led by a lion is superior to an army of lions led by a stag. His life was written by Cornelius Nepos.

Chabrier, shä-brē-ā, Alexis Emmanuel, French composer: b. Ambert, France, 18 Jan. 1841; d. Paris 13 Sept. 1894. He at first studied law, but presently turned his attention to music. He composed the operas of 'Gwendoline' (1886); and 'Le Roi Malgre Lui' (1887). Other works by him are 'Dix Pieces Pittoresques'; and 'España,' an orchestral rhapsody.

Chac-Mool, shäk-mool', according to tradition, a chief of the Maya Indians of Yucatan. In 1876 a statue was discovered in the ruins Chichen-Itza, Yucatan, to which Le Plongeon gave the name of Chac-Mool, because he supposed it to be a representation of the chief. The statue was taken by the Mexican government and placed in the National Museum of Mexico, but the correctness of Le Plongeon's identification is in question among archæologists.

Chacabuco, chä-cä-boo'kō, Chile, a mountain and mountain pass, 28 miles north of Santiago, in the province of that name. It is celebrated as the scene of a decisive victory of the republicans over the royalist troops on 12 Feb. 1817.

Chacma, chäk'ma, the Hottentot name for the baboon (*cynocephalus porcarius*) native to western Africa. It is grayish-black in color, and has a well-marked crest of hair along the neck. It is larger than the allied species of its native region. See BABOON.

CHACO — CHADWICK

Chaco, chă'kō, South America, the name formerly given to a region of vast size in the central part of the continent, on the left bank of the Paraguay River, and the right bank of the Paraná, and extending below the confluence of those rivers, from about 20° to or beyond 28° south latitude. For years it was claimed by both Paraguay and Argentina, but effectively occupied by neither. The southern portion, below the Pilcomayo River, now belongs to Argentina, and has been divided into the territories of El Chaco and Formosa. The northern and larger portion, from the Pilcomayo River to Bolivia, belongs to Paraguay, and is called El Gran Chaco, or Paraguay Occidental. See CHACO, EL; CHACO, EL GRAN.

Chaco, El, a territory ("territorial government") of Argentina, bounded on the north by the territory of Formosa, on the east by Paraguay and the province of Corrientes, on the south by the province of Santa Fé, and on the west by the provinces of Salta and Santiago del Estero. Its area is 62,000 square miles, and its population about 30,000. Its capital is Resistencia, on the right bank of the Paraná River, with a population of 3,000. The districts near the river are inhabited by civilized people, who cultivate the soil or exploit the forests, while Indians roam in the interior. The national government has encouraged immigration by selling land to settlers at the average price of 31 cents for an acre.

Chaco, El Gran, the western section of the republic of Paraguay. It is also called Paraguay Occidental or El Chaco Paraguayo. It extends northward and westward from the right bank of the Paraguay River to the frontiers of Bolivia; Brazil bounds it on the northeast; Argentina on the southwest. By a convention concluded 3 Feb. 1876, between Paraguay and the Argentine Republic, the territory between the Pilcomayo and Bermejo rivers was surrendered to Argentina, but the part of Chaco which extends from Bolivia to the Rio Verde was acknowledged to belong to Paraguay. The other section of Chaco, which lies between the Rio Verde and the Pilcomayo, was subsequently awarded to Paraguay by the arbitrator chosen by both governments, R. B. Hayes, President of the United States (12 Nov. 1878). The commemoration of this event, and as a compliment to the arbitrator, the name of the principal town of Gran Chaco, was changed from Villa Occidental to Villa Hayes, by which name it is now known. The interior of Gran Chaco is almost entirely in the possession of nomadic tribes of Indians, some of them hostile to white men. Save Villa Hayes, Bahia Negra, and Fuerte Olimpo, there were, until quite recently, no settlements within its limits. It was regarded as a comparatively worthless, swampy, uninhabitable region. But surveys disclosed large tracts of land as desirable as any in that part of the world can be—exceedingly fertile, suitable for agricultural and grazing purposes, and in part covered with forests of valuable hard woods. The sales of such lands have greatly increased the receipts of the Paraguayan treasury. Stock-raising has become a profitable industry along the banks of the Paraguay River and for a distance of 30 miles inland. Special interest attaches to the

plan for improving navigation on the Pilcomayo River, and thus furnishing a direct outlet for the natural products and manufactures of pent-up Bolivia, via the Paraguay and Paraná rivers to Buenos Ayres and Montevideo. The area of Gran Chaco is approximately 91,499 square miles, somewhat less than one half of the total area of Paraguay.

Chacornac, Jean, zhōn shā-kōr-nāk, French astronomer: b. Lyons 21 June 1823; d. Paris 20 Sept. 1873. He is principally known for his discoveries of asteroids, which came about in connection with his work on the formation of ecliptic charts of the stars, and for the charts just mentioned. His asteroid discoveries were six in number, and most of his work was done at the Paris Observatory under Leverrier.

Chad, chād. See TCHAD.

Chad'band, Rev. Mr., a personage in Dickens' 'Bleak House.' He is a hypocritical minister, who pretends to be humble and to despise the world, but is in reality extremely selfish and self-indulgent.

Chadbourne, chād'bērn, **Paul Ansel**, American educator and writer: b. North Berwick, Maine, 21 Oct. 1823; d. New York 23 Feb. 1883. He was president of the Massachusetts Agricultural College at Amherst (1867-82); of the University of Wisconsin (1867-70); of Williams College (1872-81). He wrote: 'Natural Theology' (1867); 'Instinct in Animals and Men' (1872).

Chadd's Ford. See BRANDYWINE CREEK.

Chad'wick, French Ensor, American naval officer: b. Morgantown, W. Va., 29 Feb. 1844. He graduated at the United States Naval Academy in 1866, and became a captain in 1897. During the war with Spain he commanded the armored cruiser New York, the flagship of the North Atlantic squadron, and was chief-of-staff to Admiral Sampson. From 1900-3 he was president of the Naval War College. He became rear-admiral 11 Oct. 1903.

Chadwick, George Whitfield, American musician: b. Lowell, Mass., 13 Nov. 1854. He was graduated at the Leipsic Conservatory, and in 1897 became director of the New England Conservatory of Music. He has won distinction as a composer with 'Tabasco,' a comic opera; 'Jubilee,' a symphony; and 'Columbian Ode,' a chorus. Since 1897 he has conducted the annual music festival at Worcester, Mass.

Chadwick, James Read, American physician: b. Boston, Mass., 2 Nov. 1844; d. 1905. He graduated B.A. at Harvard 1865; M.D. 1871; and pursued further studies abroad. In 1873 he began practice in Boston, and became distinguished as a gynecologist. He was a founder of the American Gynecological Society, its secretary 1876-82, and president 1897. A strong advocate of cremation, he was president of the Massachusetts Cremation Society from 1894 till his death. He contributed many articles on his specialty to the 'Transactions' of the American Gynecological Association, the Boston 'Medical and Surgical Journal,' the 'American Journal of Obstetrics,' etc.

Chadwick, John White, American writer and Unitarian clergyman: b. Marblehead, Mass., 19 Oct. 1840; d. Brooklyn, N. Y., 11 Dec. 1904. His radical sermons attracted attention, and he

was a liberal contributor to current literature. From 1864 till his death he was pastor of the Second Unitarian Church in Brooklyn, N. Y. Among his works are: 'A Book of Poems' (1875); 'The Bible of To-day' (1878); 'Origin and Destiny' (1883); 'A Daring Faith' (1885); 'The Man Jesus'; 'The Faith of Reason'; 'Old and New Unitarian Belief'; 'The Power of an Endless Life'; 'The Revolution of God'; 'Theodore Parker, Preacher and Reformer' (1900); 'George William Curtis'; 'Later Poems' (1905).

Chæronea, kër-ō-nē'a, a town in Bœotia, famous as the scene of several celebrated battles of antiquity. An important battle was fought near it in 447 B.C., by which the Athenians lost the supremacy in Bœotia. A still more celebrated battle was fought 338 B.C., in which Philip of Macedonia defeated the united forces of the Athenians and Bœotians, and crushed the liberties of Greece. The fragments of a colossal sculptured lion were obtained by excavation on the site of this battle. In a third battle, fought at Chæronea, Sulla defeated the generals of Mithridates, 86 B.C.

Chætopoda, kē-tōp'ō-də, an order or subclass of the class *Annelida*, recognized by the bristles (chætæ), usually four bundles to a segment. They comprise the earthworm (q.v.), certain fresh-water and numerous annelids which live in the sea, such as species of *Serpula*, as *S arenicola*, the lob-worm (q.v.), and many other genera; the most common and one of the largest American chætopods is the "clam-worm," (*Nereis virens*), which is associated with the clam of the New England coast, burrowing deeply in the mud. The marine forms undergo a metamorphosis, hatching as a top-shaped, free-swimming larva, called a trochosphere (q.v.). Some of the forms, as *Nais*, *Syllis*, *Autolytus*, etc., also multiply by a process of self-division called strobilation, and by alternation of generations. Some of them, as *Serpula* and *Spirorbis*, live in solid calcareous tubes or shells. Certain forms are luminous. The tracks of chætopod worms occur in Cambrian strata, which are so much like those made by existing forms as to show that the type has undergone little change since the Cambrian Period, which lies at the very base of the Palæozoic Age.

Chafer, chā'fēr, the British name for a scarabeid or dung-beetle (q.v.). The larger ones, called cockchafers, are very destructive to vegetation, especially in the larval state.

Chaf'fee, Adna Romanza, American military officer: b. Orwell, Ohio, 14 April 1842. He received a public-school education; entered the regular army as a private, 22 July 1861; became a captain, 12 Oct. 1867; and colonel of the 8th U. S. Cavalry, 8 May 1899. On 4 May 1898, he was commissioned brigadier-general of volunteers for the war with Spain; on 8 July, following was promoted to major-general; and on 13 April 1899, was honorably discharged under this commission. On the last-mentioned date he was re-appointed a brigadier-general of volunteers, and on 19 July 1900, the President, having selected him to command the American military forces in China, commissioned him a major-general of volunteers. He reached Taku, China, on 28 July, and led the American con-

tingent of the allied force which entered Peking on 15 August, and rescued the foreign legationers. Gen. Chaffee made a brilliant record in the Apache Indian campaigns; commanded the troops which captured El Caney, in Cuba; and afterward was chief of staff to both Gens. Brooke and Wood, when governor-general of Cuba. His selection to command the American troops in China gave high satisfaction to his brother officers. On 19 June 1901, Gen. Chaffee was appointed military governor of the Philippines, to succeed Gen. MacArthur, but was relieved in the autumn of 1902 and ordered to the command of the East. In 1904 he was chief of staff with the rank of lieutenant-general; but resigned on 15 Jan. 1906 and was retired on 1 February.

Chaf'finch, a brilliantly colored and well-known European finch, one of the most popular and most valuable cage-birds (q.v.). It is found in large numbers throughout the continent and England, and is migratory in the more northern parts, remaining, however, in England and around the Mediterranean in winter, where it is shot in great numbers for market purposes. The top of the head and nape of the neck of the male are bluish-gray, the back is chestnut, and the black wings are streaked with two conspicuous white bars. It is sought not only because of its loud, clear, and pliable voice, but because of its docility and beauty. Its voice is susceptible to training, and its value greatly increases by cultivation, the wild bird having an unpleasant and almost harsh cry. These birds sometimes have a repertoire of as many as six tunes, the words of which they sing with almost human articulation. Their training and rearing from the nest is an important industry throughout Europe, and particularly in Germany. For a full account of the powers of song of the chaffinch see Bechstein's 'Cage-Birds.'

Chagos (chä'gōs) **Archipel'ago**, a group of islands in the Indian Ocean, nearly on the same meridian as the Laccadives and Maldives, and probably a continuation of them. It extends from lat. 7° 39' to 4° 44' S., and lon. 70° 50' to 72° 50' E. The largest, called Diego Garcia or Great Chagos, 100 miles south of the main group, is about 12½ miles long by six broad, is of a crescent shape, and consists of a coral atoll covered with cocoa palms, and enclosing a lagoon which forms a harbor four miles broad. Fish abound, and excellent green turtle may be found on the shores. The islands belong to Great Britain, and form a dependency of Mauritius. Cocoanut oil is the chief product. Pigs and poultry are raised in abundance. Pop. 750.

Chagres, chä'grēs, Colombia, a seaport on the north coast of the Isthmus of Panama, at the mouth of a river of the same name. It acquired some importance at one time as the station at which steamers landed the mails for the west coast of America, and has been frequently associated with the proposed communications between the Atlantic and the Pacific. The terminus of the railroad across the isthmus was, however, fixed at Aspinwall, about eight miles northeast, and Chagres then greatly declined. The projected Panama canal route is partly in the bed of the Chagres River.

CHAILLE—CHAIN-MAKING

Chaille', shä-yā, **Stanford Emerson**, American physician: b. Natchez, Miss., 9 July 1830. He graduated B.A. at Harvard in 1851, and M.D. at Tulane University in 1853, subsequently studying in Europe for three years. During 1862-3 he was medical inspector of the Confederate army in Tennessee, and later had charge of various military hospitals. He is a member of the National Board of Health, and in 1879 was president of the Havana yellow-fever commission. Since 1858 he has held various professorships in Tulane University, Louisiana, and since 1886 has been dean of the medical department, and professor of physiology, hygiene, and pathological anatomy. He has published: 'Yellow Fever in Havana and Cuba'; 'Origin and Progress of Medical Jurisprudence, 1776-1876' (1877); 'Laws of Population and Voters' (1872); 'Living, Dying, Registering, and Voting Population of Louisiana, 1868, 1874, 1875'; 'Intimidation of Voters in Louisiana' (1876). From 1857 to 1868 he was co-editor and proprietor of the New Orleans 'Medical and Surgical Journal.'

Chaille'-Long, Charles, American soldier, explorer, and diplomat: b. Princess Anne, Somerset Co., Md., 2 July 1842. He was educated at Washington Academy, 1860, and graduated from the Columbia Law School in 1880. He enlisted in the Union army in 1862; was promoted captain and mustered out in 1865; appointed lieutenant-colonel in the Egyptian army 1869; chief of staff to General Gordon 1874-77, during which time he concluded a treaty with King M'Tesa annexing Uganda to Egypt; 19 July 1874, discovered Lake Ibrahim and solved the problem of the Nile sources August 1874; was wounded at M'Rooli 17 Aug. 1874; promoted colonel and brigadier, took part in the conquest of the Niam-Niam country, and in the expedition to the east coast of Africa 1875-6; and in August 1877 returned to the United States. Returning to Egypt in 1882, he became acting consul of the United States at Alexandria from June to August 1882, after the massacre of 11 June. He was consul-general and secretary of legation to Korea 1887-89; secretary of the Universal Postal Congress, Washington, May 1897; and chargé d'affaires (October 1897-September 1898) of the special commission to the Paris exposition 1900. He has published 'Central Africa: Naked Truths of Naked People' (1876); 'L'Afrique Centrale' (1877); 'The Three Prophets' (1883); 'Les Sources du Nil' (1891); 'L'Égypte et ses Provinces Perdues' (1892); 'La Corée ou Chosen La Terre du Calme Matinal' (1894); and compiled, translated and edited 'Les Combattants Français de la Guerre Américaine 1778-83; etc.

Chaillu, Paul du. See DU CHAILLU.

Chain, in surveying, is a measure consisting of 100 links, equal to 4 rods, or 66 feet, used for measuring land. It is sometimes called Gunter's chain, from its inventor.

Chain-bridge. See BRIDGE.

Chain-cable. See CABLE.

Chain-making. Iron and not steel is still the favorite material from which chains are manufactured. Chain cable is employed in quarrying, for lifting heavy weights in building construction, in foundries and machine shops, or at the docks in loading and unloading vessels; and to the lumberman it is absolutely indispensable; while last, and most important of

all, is its use as a ship's cable, where, in times of stress, a vessel costing hundreds of thousands of dollars, together with priceless human lives, may depend upon the sound quality of the material and the fidelity with which the smith has welded the chain, link by link, on his anvil.

Quality of Iron for Chain Making.—The iron used is a specially rolled grade, of high tensile strength and great ductility, the object being to secure a chain which, on the application of a sudden stress—as, for instance, when a ship is riding at anchor in a heavy seaway—will stretch and so resist the strain gradually, instead of snapping, as would be liable to happen with material of higher tensile strength but small ductility or power of elongation. Chain of from 5-16 inch up to 2 inches diameter is forged by hand, and above 2 inches it is forged with the assistance of machinery.

Hand-made Chain.—In the smaller sizes the whole operation of chain-making is done by a single smith without any helper. The length of completed chain is hung upon a hook or some convenient support near the anvil, and the operation of forging the link proceeds as follows: In his fire the smith will have two or three short rods of the required diameter, and as one is heated to, say, a cherry red, he withdraws it, cuts off the desired length for one link, gives it a couple of blows to form the welding scarf, bends it through, say, about 130 degrees, hooks it into the end of the completed chain, and brings the ends together for welding. He then raises the link to a welding heat in his fire, places the abutting ends over what is known as the bick-iron, gives it a few taps to insure a good weld, brings over a "dolly" (which is hinged at the outer end of his anvil and when brought over registers above the bick-iron), and with half a dozen blows on the dolly, accompanied with a dexterous movement of the link, the weld is completed and the link smoothed up to a neat finish. The rapidity with which the smiths do this work is very remarkable. Thus, in the case of a 7-16-inch chain, with 30 links to the yard, an expert smith will cut off from the iron bar, scarf, bend up into shape, and weld the links, at the rate of 18 yards in a day of nine working hours, which is two yards per hour, or one link per minute. In forging 1¼-inch chain the smith uses two helpers, and the iron is cut to about one-foot lengths, and several of these are being heated in the fire at the same time. The operation is as follows, the various steps succeeding each other with great rapidity: First, the helper to the right of the anvil withdraws the heated piece, drops one end into an eye at the end of the anvil, and bearing down upon the tongs, bends the piece over to an angle of about 45 degrees. The smith then takes it in his tongs, and with a few taps of the sledge it is bent around. It is heated again, passed through the end of the chain by the smith, laid flat on the anvil and the welding scarfs are put on with a few blows of the sledge. The link is now raised to a welding heat, welded by a few blows by the helpers, laid over the bick-iron, the hinged dolly is brought over, and a few rapid blows on the dolly, while the smith turns the link to and fro, serve to bring the weld up to a smooth finish. The link is now laid on edge; a single blow from the sledge brings it into shape, and with a final tap or two of the smith's hammer the link is finished. At this forge as

CHAIN-SHOT — CHALCEDON

many as 35 links will be added to a heavy chain of this size in one hour, or say about one every two minutes.

Machine-made Chain.—In the heavier sizes of chain of over 2 inches diameter, it becomes necessary to call in the aid of machinery in shearing the iron into lengths for the links and in bending the links into shape. The scarfs are produced by shearing the iron at an angle of 60 degrees with the axis of the bar, all cuts being taken with the inclination in the same direction, so that when the links are formed up the scarfs will lap in the desired relative position. The iron is then heated and placed in a hydraulic bending machine, where it is formed against a block into a rough U-shape at the first stroke, and then rolled into the oval link form on another block adjoining the first. The scarfed ends are left wide enough apart to allow of the link being hooked onto the end of the chain which is being forged. The scarfed ends are now brought down snugly into contact under an automatic quick-acting hammer, and the link is heated and then welded up under the same hammer. Most of the ship cable has a cast-iron stud inserted in each link. The ends of the stud are hollow, to match the round of the chain, and when the link has been hammered down snugly into place, it is impossible for the stud to be displaced. Indeed, the pull upon the cable, by tending to straighten it out, causes the link to tighten upon the stud and hold it the more securely in place. Cables are made in standard lengths of 15 fathoms or 90 feet, and any greater length is obtained by shackling several of the 15-fathom lengths together, the average length of a ship's cable being about 90 fathoms, or 540 feet. The life of such a cable is about 10 years.

Blacking.—When the 15-fathom length is completed, it is placed in an iron box and heated by steam, and then drawn through a vat of boiling tar, known as the "tar kettle." Here it receives a thorough coating, after which it is drawn out upon an iron grating, where the surplus tar is allowed to drain off, leaving a heavy protective coat upon the cable. In conclusion it should be noted that although each link of a chain consists of two thicknesses of bar, it must not be presumed that a chain possesses double the strength of a single bar; actually there is a reduction of three tenths in the strength, due to the formation into links, so that the chain has but about seven tenths of the united strength of two bars of the same diameter of iron. Moreover, as the strength per square inch of a heavy bar is not so great as that of a smaller diameter iron, there is further reduction to be made on this account. Thus, if a bar of ordinary rolled iron shows a breaking strength of 20 tons per square inch, the breaking strength will decrease to 19 tons up to 2 inches, and 18 tons per inch up to 3 inches diameter of rod. Consequently the breaking strength of chain made of 1-inch iron will be about 50,000 pounds, and the breaking strength of 2-inch chain about 190,000 pounds.

Chain-shot, a projectile consisting of two balls connected by a bar or a chain, formerly used for cutting and destroying the spars and rigging of an enemy's ship. It was invented by Admiral De Witt in 1666, but has long been disused.

Chain-snake, a harmless terrestrial snake, ranging from the Great Lakes to Mexico. In length it is from four to five feet, the color varying with the species. In the East and South the typical form (*Ophiobolus getulus*) is glossy black, with a chainlike pattern of yellow lines covering its back; the belly is dirty yellow, blotched with black, and the head-plates are black, spotted with yellow. A larger variety, found west of the Mississippi, is "cream-colored, sharply marked with rings of black." Chain-snakes feed upon small mammals, amphibians and reptiles, including venomous serpents.

Chain-timber, a timber of large dimensions placed in the middle of a building to give it strength. Called also bond-timber.

Chainey, George, American clergyman: b. England 1851. At first a Methodist minister, he resigned in 1877, and for the next three years was pastor of the Unitarian church in Evansville, Ind. Since then he has been chiefly engaged in lecturing and writing upon theological subjects and mysticisms, traveling through Australia and Palestine on his lecture tours. He is editor of 'The Interpreter'; and conducts a "school of interpretation." Publications: 'Foundation Stones'; 'Unitarian Sermons' (1879); 'The New Version: Discourses on the Bible' (1882); 'She: An Allegory of the Church' (1889); 'Jeanne D'Arc' (1888); 'The Ten Commandments' (1900).

Chair, an article of domestic furniture, having legs, a back, and sometimes arms; usually for the accommodation of one person. A sociable or vis-à-vis, sometimes considered as a chair, has seats for two. Among the Romans the word *sella* was used generically for seats of various kinds, and had usually a qualificative term appended to it, as *sella curulis*, *sella balnearis*. They had also specific names for different kinds of seats; a seat with a back, like our chairs, was called *cathedra*. Chairs were much less common, both with the ancients and in the Middle Ages, than they are in modern times; hence, perhaps, the reason why chair and *cathedra* have both given their names in an allegorical sense to various dignities. We speak of the chair of justice, and the chairman of a meeting, and *cathedra* is now most widely known by its derivative cathedral, the name still given to a metropolitan church.

Chair of St. Peter, The, a relic at Rome of which the first known mention was made by Ennodius in 500, and a feast in honor of which was instituted or restored by Paul IV. in 1558. It was exposed for public veneration by Pius IX. in 1867. It is of wood overlaid with ivory and gold.

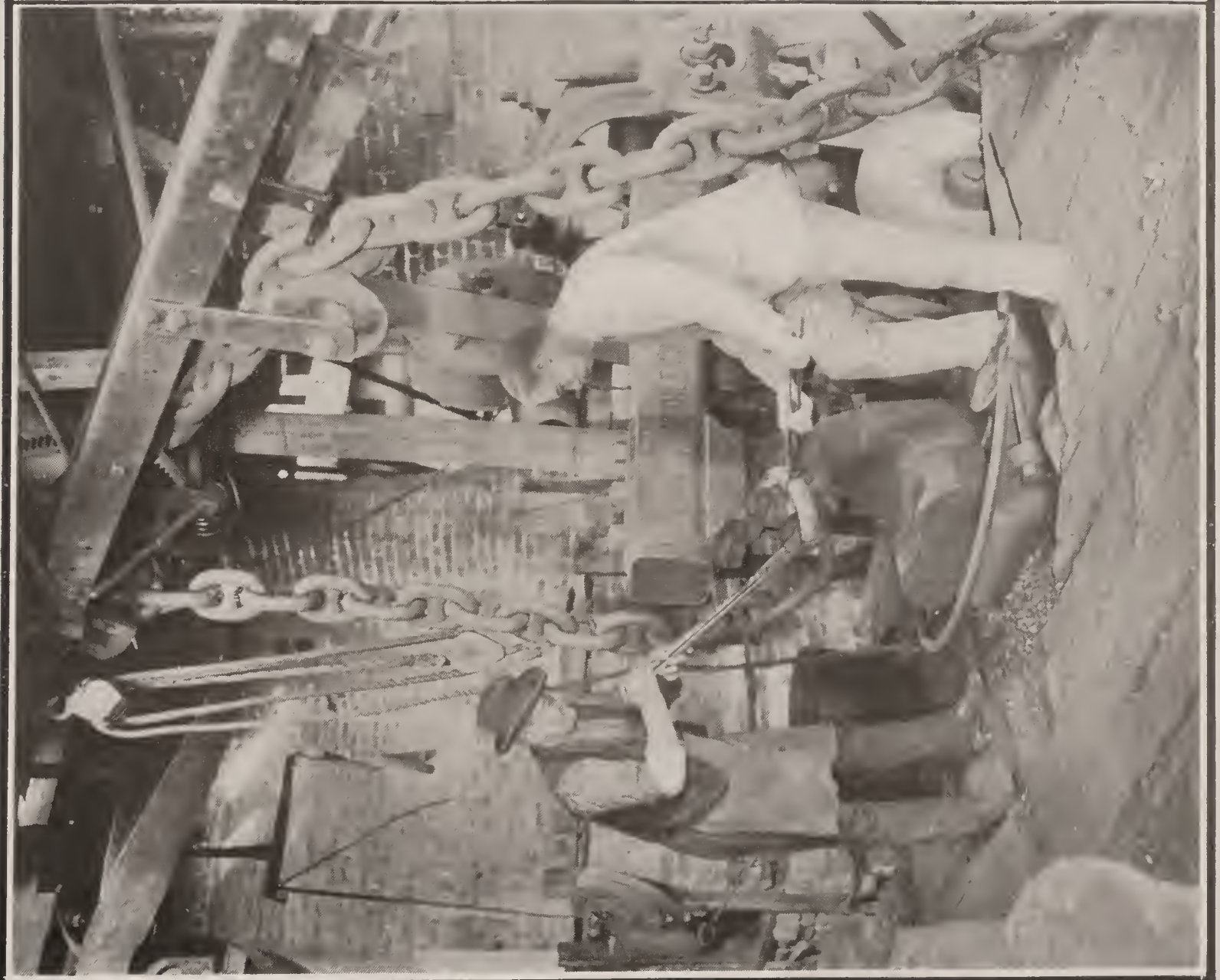
Chaise, *shāz*, a two-wheeled carriage for two persons, with a calash top, and usually drawn by one horse.

Chalcedon, *kāl-sē'dōn*, a city of ancient Bithynia, opposite Byzantium, at the entrance of the Euxine, about two miles south of the present site of Scutari. Chalcedon is said to have been founded before Byzantium, and was a flourishing town when it came into possession of the Romans, under the testament of Nicomedes 74 B.C., as included in the kingdom of Bithynia. It was finally destroyed by the Turks, by whom it was taken about 1075. At

CHAIN MAKING.



Inserting the Stud in Heavy Stud Chain.



Bringing Scarfed Ends of Link Together Ready for Welding.

MANUFACTURE OF HEAVY MACHINE-MADE CABLE.

CHALCEDONY — CHALCONDYLAS

Chalcedon in 451, Marcian, the emperor of the East, held the fourth general council for the purpose of destroying the ascendancy of the Monophysite doctrines obtained in 449 by the influence of the Alexandrian patriarch Dioscurus at the (so-called) robber-synod at Ephesus; and define the Christian faith so as to guard its orthodoxy against the Nestorian and Monophysite heresies. The Council, which opened on 8 Nov. 451 under the guidance of Paschasinus, the bishop deputed by Leo. I., about 600 bishops, mostly from the East, being present, deposed Dioscurus, and after violent debates the articles of faith settled by them declared, in opposition to the Monophysites, the belief of two natures in Christ, existing without mixture or change, without division or separation, so that by the union of the two natures in one person and substance their distinction is not destroyed, but the characteristics of each are retained. Besides this creed the council promulgated 30 canons against clerical abuses, of which canons the twenty-eighth conceded to the see of Constantinople second rights and privileges to the Roman, but Pope Leo I. refused to confirm it. Rebellions in Palestine and Egypt were the immediate consequences of the decrees of the council of Chalcedon against Dioscurus and the Monophysites; and not till after a long period of ecclesiastical contests did the Chalcedon formula of faith obtain the undisputed authority which it now has in the Catholic, Greek, and many Protestant churches.

Chalcedony, käl-sěd'-ō-nī (from Chalcedon, an ancient Greek town in Asia Minor), a cryptocrystalline variety of quartz, transparent or translucent with a waxy lustre, and white, gray, blue, brown, or black in color, but commonly of a tint suggestive of diluted milk. It occurs in masses, also very frequently in mammillary, botryoidal and stalactitic forms. It is used for ornament and is often called "white agate."

Chalced'onyx, the name applied to those agates in which opaque white chalcedony alternates with the translucent gray variety.

Chalchihuitl', chäl-chī-wēt'l', a bluish-green mineral, highly prized by the ancient Mexicans, and identified with jadeite by some authorities, with emerald by others, and with the turquoise of the Santa Fé region by still others. The last-mentioned conjecture is probably correct.

Chalcis, käl'sīs, a town of Greece, in the island of Negropont or Eubœa, separated by the narrow Strait of Euripus from the mainland, with which it is connected by a bridge that opens to let vessels through. The modern town is now one of the most attractive in Greece, and consists of an inner walled town and an outer or suburban portion, the walls being the work of the Venetians. In the inner town the streets are narrow and the houses lofty. Several of the churches were formerly mosques. Ancient Chalcis was one of the greatest of the Ionic cities, carried on a large trade, and planted numerous colonies. It had also colonies on the coasts of Macedonia and Italy, in Sicily, and in the islands of the Ægean Sea. The Chalcians joined the Bœotians in a war with Athens, in which they were defeated 506 B.C. After the Persian wars Chalcis became tributary to Athens. The Chalcians revolted 445 B.C., along

with the Eubœans, but were vanquished by Pericles. Another revolt occurred 411 B.C., and Chalcis for a short time became independent. A bridge was at this time built across the Euripus, and fortified; a passage sufficient for a single ship being left in the middle. It was subsequently occupied by the Macedonians, and after various vicissitudes fell under the yoke of the Romans. Chalcis joined the Achæans in their last war with Rome, when the city was taken and destroyed by Mummius. It was afterward rebuilt, and about the beginning of the Christian era was the chief city of Eubœa. It was held by the Venetians from 1210 to 1470, when it was taken by the Turks. Pop. about 10,000.

Chalcis (käl'sīs) **Flies**, a family (*Chalcididæ*) of parasitic *Hymenoptera*, allied to the ichneumon flies, and with similar habits. The fore wings are nearly veinless; the posterior margin of the prothorax not reaching the tegulæ; while the ovipositor issues from before the end of the abdomen. The chalcids are generally minute, a few almost microscopic; many of them of beautiful shades of green, with metallic reflections. A goodly proportion of them are secondary parasites, that is, are parasitic on other chalcids; some deposit their eggs in galls. Typical genera are *Pteromalus* (*P. puparum*), *Semiotellus*, and *Chalcis*. *Eurytoma hordei* is the wheat joint-worm, not being carnivorous or parasitic in other insects. Our largest chalcid is *Leucospis affinis*. Aside from the immense benefit these chalcid flies confer on agriculture by destroying noxious caterpillars, etc., the fig insect (*Blastophaga grossorum*) is the agent in enhancing the value and flavor of figs. See CAPRIFICATION.

Chalcocite, käl'-kō-sīt (χαλκός, "copper"), a native sulphide of copper having the formula Cu_2S . It crystallizes in the orthorhombic system, and also occurs in massive and granular forms. It has a hardness of from 2.5 to 3, and a specific gravity of from 5.5 to 5.8. It is opaque and leaden in color, with a metallic lustre. In the United States it occurs in crystals at Bristol, Conn., massive as the principal copper ore at Butte, Montana, and similarly in many copper mines in Arizona; also in Mexico, Chile, and Peru. Beautiful crystals come from Cornwall, England, and one crystal, found in Tuscany, weighs half a pound. It contains 80 per cent of copper and is known also as "copper-glance," "chalcosin," and "redruthite."

Chalcondylas, käl-kön'dī-lās, **Deme'trius**, Greek grammarian: b. Athens about 1424; d. Milan 1511. He was a pupil of Theodore Gaza, and on the taking of Constantinople by the Turks came to Italy, where he taught the Greek language, was invited to Florence by Lorenzo di Medici about 1479, and proceeded afterward on the invitation of Ludovico Sforza, to Milan. He spread the study of the Greek language and literature in the west of Europe, and sent out several celebrated scholars. Among the works edited by him was 'Homer' (1488); 'Isocrates' (1493); and 'Suidas' (1499). He also compiled a Greek grammar, which was long in general use as a school-book. In his editions of the Greek authors he was somewhat arbitrary in his emendations of the text. His brother Laonicus, after witnessing the fall of Constantinople, followed his brother to Italy. He is the author of

CHALCONDYLAS — CHALICOTHERIUM

a history of the last years of the Byzantine empire, from 1297 to 1462.

Chalcondylas, Laon'icus, Greek historian: b. Athens; d. about 1464. He was a brother of Demetrius Chalcondylas (q.v.). He was an ambassador of John VII. during the siege of Constantinople, and wrote a 'History of the Byzantine Empire 1297-1462.'

Chalcopyrite, käl-kō-pī'rīt (Gr. χαλκός "copper" pyrites), a native sulphide of copper and iron, having the formula $Cu_2S.Fe_2S_3$, and crystallizing in the tetragonal system, commonly with a tetrahedral aspect. Chalcopyrite is brass-like in appearance, and is often tarnished and iridescent. It has a specific gravity of about 4.2, and a hardness of from 3.5 to 4. It is widely distributed, and in Cornwall, England, it constitutes the chief ore of copper. It occurs in many parts of the United States also. Owing to the iridescence noted above, it is often called "peacock ore." It is softer and deeper in color than ordinary iron pyrites, with which it is sometimes confused.

Chaldæa, käl-dē'a, in ancient geography, the southerly part of Babylonia, toward Arabia and the Persian Gulf, lying west of the mouth of the Tigris and Euphrates. The Chaldæans are supposed to have been at first a wandering and predatory race like the Arabs, who afterward became settled, and ultimately gave their name to Babylon and the Babylonian empire. The name Chaldæan was especially applied to a portion of the Babylonian Magi, who were devoted to the pursuit of astronomy and magical science.

Chaldæan (käl-dē'an) Christians, a branch of the Nestorians, in communion with the Roman Catholic Church. The Patriarch is directly subject to the Propaganda, is an archbishop, and the priests, who are very poor, number 108. In all essentials of doctrine and morals the Chaldæan Christians are in perfect conformity to the Catholic Church, but the clergy are permitted to marry before taking the higher orders, and not a few customs and rites of the Nestorians are found among them. About 40 monks in the monastery of Mar Jurgis follow the rule of Saint Anthony. In 1826 the Chaldæan Christians numbered 120,000, but in consequence of wars, famines and Kurdish cruelty, the present population is about 40,000.

Chaldean MS., The, a skit at the expense of the publisher Constable, and of the Edinburgh notables specially interested in the Whig 'Edinburgh Review'; prepared by the editors for the seventh number of the new Tory 'Blackwood's Magazine,' October 1817. In form it was a biblical narrative in four chapters, attacking Constable, and was perpetrated by James Hogg, the "Ettrick Shepherd," whose original paper was greatly enlarged and modified by Wilson ("Christopher North") and Lockhart.

Chaldee (käl'dē) Language, a form or dialect of the Aramean, one of the three principal varieties of the ancient Semitic. The region called in Scripture Aram may be described generally as occupying the northern and northeastern divisions of that corner of Asia which was the home of the Semitic languages. It was bounded on the north by the Taurus range and the river Tigris, which latter also formed its eastern boundary; on the west by the Mediter-

ranean and Mount Lebanon; and on the south by Palestine and the Arabian desert. The Aramean language was very extensively known, not only within the limits above mentioned, but beyond them. The princes of Judea and Assyria were familiar with it; it was spoken in the palace of Nebuchadrezzar, and even formed the medium of communication between the Persian court and its subjects in Judea and Samaria. It may also lay claim to a high antiquity, being probably the language of Abraham previous to his migration into Palestine, and certainly of his grand-nephew Laban. Unfortunately the older monuments of the language have perished, the Chaldee portions of Daniel and Ezra being the earliest specimens we possess of a language which had probably existed and flourished at least 2,000 years before. There is another dialect of the Aramean besides the Chaldee, namely, the Syriac, and in this as well as in the Chaldee numerous writings are still extant, but they are all of comparatively recent date. The Chaldee literature is usually arranged in two divisions: the biblical Chaldee, or those portions of the Old Testament which are written in Chaldee, namely, Daniel from ii. 4 to vii. 28; Ezra iv. 8 to vi. 18, and vii. 12-26; and Jeremiah x. 11; and the Chaldee of the Targums and other later Jewish writings. The former is distinguished by a closer approach to the Hebrew idiom, and is therefore considered less pure than the Chaldee of the Targum of Onkelos, the oldest and most valuable of the Targums.

Chalder, chäl'dër, an obsolete Scotch dry measure containing 16 bolls or 12 imperial quarters.

Chal'dron, an English measure of 36 bushels, used chiefly in measuring coal.

Châlet, shă-lă' ("a little castle"), the wooden hut of the Swiss mountain herdsman; a French-Swiss name, which is also extended to Swiss houses generally, as well as to ornate and picturesque villas built in similar style.

Chaleur Bay, shă-lër, or **Bay of Chaleurs**, an inlet or arm of the sea in the Gulf of St. Lawrence, between Quebec and New Brunswick. The French fleet was here defeated by the British in 1760. There are a number of islands in this bay, notably Shippegan, near its mouth. The navigation is good and the mackerel fishery is important.

Chalice, chäl'is (Latin, *calix*), a cup or bowl. This term, originally signifying a common drinking vessel, is now usually applied to a communion cup. From wood or other cheap material in early times, chalices came to be made of glass, agate, silver, and gold, with engraving, enamel, and different kinds of costly decoration. Some of them have great historic interest and value, and are preserved in church treasuries and various museums of Europe. It is generally held that a chalice must have a knop or ball in the middle of the stem or foot which supports the bowl. This is intended to secure the hold of the person who hands it to the communicant. It has also a cover which may be the paten or dish for the consecrated bread. When the Protestant separation took place in England, the communion-cup was made of a wholly different pattern from the chalice.

Chalicotherium, käl'ï - kō - thē'rī - ūm, or **Macrotherium**, māk-rō-thē'rī-ūm, an extinct

CHALK — CHALLENGE

ungulate of the Miocene Epoch, as large as a rhinoceros, but hornless and with enormous claws on the toes of both fore and hind feet,—a character almost unique among the *Ungulata*. The animal was distantly related to the *Titanotherium* (q.v.), but is usually placed in a distinct sub-order, the *Ancylopoda*. The foot-bones, when first found, were supposed to belong to an animal related to the *Edentata* (sloths, ant-eaters, and armadillos), and was described by Cuvier as a *pangolin gigantesque*; but the discovery of a complete skeleton (preserved in the Museum of the Jardin des Plantes, Paris), showed its true relationships.

Chalk'. In geology chalk is a soft, friable, finely granular variety of limestone, and may in color range from pure white to grayish or buff. It is a marine deposit, composed principally of the shells of foraminifera. In the United States are some great beds of chalk of Upper Cretaceous Age. One is exposed for 250 miles from Austin to Sherman, Texas, and is nowhere much less than 600 feet thick. Chalk beds of the same age, Colorado stage, are found in Arkansas, Kansas, and in Montana, while the great chalk belt of Texas extends southwest from Austin into Mexico, being found in the states of Chihuahua, Coahuila, and Tamaulipas. In Arkansas and Texas this chalk formation and its associated chalky marls is being developed as furnishing excellent material for making Portland cement. No statistics of the amount thus used at present are available. In England the Upper Cretaceous series is marked by great beds of chalk and chalky limestones, and includes the Cenomanian, Turonian, and Senonian stages. Such strata extend across England from Flamborough Head on the east coast to west of Dover on the south coast. The chalk-mining industry of England is of importance, the total amount of chalk produced in 1901 being 4,399,000 tons. Part was used for cement-making and part for making refined chalk. (See CEMENT; CRETACEOUS SYSTEM.) 'United States Geological Survey Report, 1900-1,' Part III.; 'The Chalk of Northwestern Arkansas.'

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Chalk, Red, or Reddle, a red, amorphous variety of hematite or sesqui-oxide of iron, containing much clay. To this fact it owes its firm, compact texture. It has an ocher-red color and is used chiefly by carpenters for making marks on wood, and by tailors for marking on cloth; the finer, by painters. It occurs in thin beds in clay-slate and gray wacke-slate in parts of Germany.

Chalkley, chäk'li, Thomas, American Quaker itinerant preacher: b. London 3 March 1675; d. Tortola, West Indies, 4 Sept. 1741. He spent his life preaching in New England and the Southern colonies; toward its end he made his home near Philadelphia. His chief work was his 'Life, Labors, and Travels,' whose quaintness made it popular even outside the Society of Friends, and has caused it to be several times reprinted.

Challemel-Lacour, Paul Armand, pōl är-män shäl-mël-lä-koor, French statesman: b. Avranches 19 May 1827; d. Paris 26 Oct. 1896. He was graduated at the École Normale in

1849 and soon fell under the ban of political proscription. He was elected to the French Chambers, however, and served the republic as senator, ambassador to Switzerland from 1874 to 1879, ambassador to England from 1880 to 1882, Minister of Foreign Affairs and president of the Senate in 1888. He was elected to the French Academy in 1893, and was editor of the 'Republique Française.'

Chal'enge, originally, an accusation, charge, or claim. A challenge to jurors is an objection either to the whole panel or array, that is, the whole body of jurors returned, or to the polls, that is, to the jurors individually; and it is either peremptory, that is, without assigning any reason, or for cause assigned. A peremptory challenge is allowed to be made only by the party accused, and not by the government or prosecuting officer, and only in capital cases; and is said to be permitted on the ground that a man is liable to conceive a prejudice against another from his mere looks and appearance, for which he can give no reason; and such may be the case of the accused; and it is conceded, in favor of life, that in such case he may exclude the juror without assigning any reason; and also on the ground that, by questioning a juror as to any objection to him, his prejudice may be thereby excited against the prisoner, who, to save himself from the effect of such prejudice, is permitted to have him rejected. The ground on which peremptory challenge is allowed supposes the prisoner's life to be in danger, and he is not entitled to it if he pleads in bar or abatement; for the trial of these pleas does not decide on his life. He must, before making such challenge, plead "not guilty," or some plea the trial of which decides on his life. Having pleaded such a plea, the accused might, by the common law, peremptorily challenge 35 jurors; but the statute 22 Hen. VIII. c. 14 limited the number to 20 in felony. The regulating statute now in force in Great Britain is 6 Geo. IV. c. 1. By the law of the United States a peremptory challenge of 35 jurors is allowed in trials for treason, and 20 in those cases of felony mentioned in the statute. A challenge of the whole panel may be made because the jury is illegally drawn or summoned, whereby it is not a legal jury; and a challenge of this description may be made by the government as well as by the prisoner. Challenge to the polls may be made both in civil and criminal suits for cause, as that the juror is an alien, not from the proper district, not duly qualified as a freeholder, not of suitable age, etc., or is near of kin to one of the parties, is biased, has been guilty of felony, is interested, or is subject to any other exception, according to the common principles of proceeding or the provisions of any statute on the subject. In courts-martial a prisoner who objects to either of the judges must assign his reasons. In other words peremptory challenges are not allowed in these courts. The privilege of challenging here belongs equally to the prisoner and the prosecutor. The right of challenging the members of a court-martial prevails on the continent of Europe, as well as in England and America.

A challenge to fight a duel is punishable in England with fine and imprisonment. In several of the United States of America this offense

CHALLENGER EXPEDITION — CHALMERS

is subject to the additional punishment of ineligibility to any public office, either for life or for a limited term. See DUEL.

Chal'lenger Expedition, an expedition conducted in 1872-6, under the auspices of the British government, for the purpose of exploring the open ocean. The Challenger was fitted with everything that could be carried in the way of appliances for scientific research, and placed in command of Capt Nares. Prof. Wyville Thomson and scientific staff conducted the investigations and determined the depths of waters, the configuration and condition of the sea-floor, the fauna, the currents, atmospheric conditions, etc. During the three and a half years they covered nearly 70,000 nautical miles. The route was south to Madeira, thence to the Canaries, the West Indies, and north as far as Nova Scotia; south again to Cape Verde, then to Cape of Good Hope, Australia, the China Sea, Japan, the west coast of South America, through the Straits of Magellan, and back to England. The narrative of the expedition is told in popular form in Moseley's 'A Naturalist on the Challenger.' A complete account of the scientific results was gradually published in 50 splendid volumes, by Wyville Thomson and Dr. John Murray.

Chal'lis, James, English astronomer: b. Braintree, Essex, 12 Dec. 1803; d. Cambridge 3 Dec. 1882. In 1836 he was elected Plumian professor of astronomy at Cambridge and director of the observatory. In 1861 he was succeeded in the latter position by Adams, but retained the professorship of astronomy till his death. He is best known for his work upon the theory of astronomical instruments, and for his observations in connection with the discovery of the planet Neptune.

Chal'loner, Richard, English Roman Catholic bishop: b. Lewes, England, 29 Sept. 1691; d. London 12 Jan. 1781. His parents were Protestant dissenters from the established religion of England. After the death of his father young Challoner came under other influences and was received into the Catholic Church. At the age of 13 years he entered the English college at Douai in France and there, after completing his studies, was ordained priest and appointed professor of divinity. He remained in this station till 1730, when he was sent on the English mission with London as his field. He wrote many controversial tractates and many devotional manuals. Among his writings is 'The Catholic Christian Instructed,' a sort of advance catechism of the Roman Catholic faith, in the preface to which he made an ingenious and spirited reply to Dr. Middleton's famous 'Letter from Rome, Showing an Exact Conformity Between Popery and Paganism.' Middleton, smarting from the keenness of Challoner's controversial weapons, invoked against his adversary the penalties prescribed by the penal laws enacted for the extermination of the Roman Catholic religion. In 1741 Challoner was consecrated bishop and made coadjutor to the bishop in charge of the "London District," for the assumption of a see-title in England by a Roman Catholic bishop was a penal offense. Besides the work already mentioned, Challoner wrote the devotional work, 'Garden of the Soul,' which is still in general use among Roman Catholics as a prayer-book. He wrote also, in two

volumes, 'Memoirs of Missionary Priests and Other Catholics of both Sexes Who Suffered Death or Imprisonment in England on Account of Their Religion, from the Year 1577 till the End of the Reign of Charles II.'; also 'Britannia Sancta,' lives of English, Scotch and Irish saints. He revised the Douai-Rheims English version of the Old and New Testaments, improving and modernizing the style.

Chalmers, chä'mérz or chäl'mérz, Alexander, English journalist, editor, and miscellaneous writer: b. Aberdeen 29 March 1759; d. London 10 Dec. 1834. He received a good classical and medical education in his native city, where his father, the founder of the first Aberdeen newspaper, was a printer. About 1777 Chalmers went to London, and was employed as a contributor to the *St. James' Chronicle*, the *Morning Chronicle*, the *Morning Herald*, and various critical magazines and reviews. He edited numerous editions of the English classics, particularly the 'British Essayist' (45 vols. 12mo 1803), commencing with the 'Tatler,' and ending with the 'Observer,' together with prefaces, histories, and biographies; the 'Spectator'; 'Tatler'; and 'Guardian' (12 vols. 8vo 1822); an edition of Shakespeare, with historical and explanatory notes, in 1809; 'The English Poets from Chaucer to Cowper,' with Johnson's 'Lives,' and additional 'Lives' by Chalmers (21 vols. royal 8vo 1810). The most important and valuable of Chalmers' extensive literary labors, however, was the 'General Biographical Dictionary' (32 vols. 8vo 1812-17), the fullest body of biographical information published up to his time in England, and which has rendered invaluable service to subsequent compilers. Chalmers was as much distinguished for painstaking accuracy as an editor, combining patient and intelligent investigation of facts with literary discrimination, as for the industry which enabled him to accomplish so large an amount of work.

Chalmers, George, Scottish antiquary: b. Fochabers, Elginshire, 1742; d. 31 May 1825. Having studied law at Edinburgh, he removed to America, where he practised that profession for upward of 10 years, till the colonies declared themselves independent. Chalmers being a keen Loyalist, returned to Great Britain, where he was in 1786 appointed to the office of clerk to the Board of Trade.

Previous to his appointment he had published 'Political Annals of the United Colonies' (1780); 'Estimate of the Comparative Strength of Great Britain During the Present and Four Preceding Reigns' (1782); and 'Opinions on Interesting Subjects of Public Law and Commercial Policy, Arising from American Independence' (1784). In 1790 he published his life of Daniel Defoe; in 1794 his life of Thomas Ruddiman (a very curious book); in 1800 he edited the works of Allan Ramsay, with an elaborate memoir of the poet; in 1805 the works of Sir James Stewart of Coltness, also with a life prefixed; and in 1806 the writings of Sir David Lindsay of the Mount. The first volume of his 'Caledonia' (1807), in quarto, displayed a vast extent of erudition and research. It professes to be an account, historical and topographical, of North Britain, from the most ancient to the present times; and the original intention of the author was, that it should be completed

CHALMERS

in 4 volumes 4to, each containing nearly 1,000 pages. Chalmers left the remainder of his great work nearly ready for the press; and it was subsequently published complete, with numerous annotations. He also wrote a 'Chronological Account of Commerce and Coinage in Great Britain' (1810).

Chalmers, George Paul, Scottish painter: b. Montrose 1833; d. Edinburgh 28 Feb. 1878. After serving in succession under a surgeon and a ship-chandler, he went to Edinburgh in 1853 in order to become an artist. He was elected an Associate of the Royal Scottish Academy in 1867, and four years later was elected to full membership. His pictures, which are characterized by rich coloring, consist mainly of portraits and subjects, though during his later years he produced several landscapes. The most important are the 'Favorite Air' (1864); 'End of the Harvest' (1873); 'Running Water' (1875); 'Threescore Years and Ten' (1875); 'Prayer' (1876); 'Knitting' (1876); and 'The Legend' (unfinished).

Chalmers, Thomas, Scottish clergyman: b. Anstruther Easter, Fifeshire, 17 March 1780; d. Edinburgh 30 May 1847. At the age of 12 he was sent to the University of St. Andrews, for the purpose of studying for the Church, and after passing through a curriculum there seven years, was licensed as a preacher in July 1799, the rule of the Scottish Church requiring that a licentiate shall have reached the age of 21 being dispensed with in his case, in virtue of the exceptional clause in favor of those possessing "rare and singular qualities."

In May 1803 he was presented to the parish of Kilmany, in the northeast of Fifeshire, and opened classes of his own for teaching mathematics in the town of St. Andrews. These were so successful that he commenced a class in chemistry also, his lectures on and demonstrations in which created quite a sensation. About this time his views as to the obligations of a Christian pastor were very different from what he was subsequently led to entertain, and he deemed it a sufficient fulfilment of these to return to Kilmany on the Saturday evenings, and from thence back to St. Andrews on the Monday mornings, devoting the bulk of his time to scientific pursuits. In 1808 he published an 'Inquiry into the Extent and Stability of National Resources,' the object of which was to show that the Berlin decree would not touch the real foundations of the prosperity of Great Britain.

In 1813 his article on Christianity appeared in the Edinburgh 'Encyclopædia,' and shortly afterward his review of Cuvier's 'Essay on the Theory of the Earth,' in the 'Christian Instructor.' In this last he propounded the interpretation of the first verses of Genesis, afterward adopted by Dr. Buckland, with a view to make the truths of revelation and the discoveries of geological science harmonize. In his lectures at St. Andrews in 1803 he had already said, "The writings of Moses do not fix the antiquity of the globe. If they fix anything at all, it is only the antiquity of the species." His fame as a preacher had by this time extended itself throughout Scotland, and a vacancy having occurred in the Tron Church of Glasgow, he was elected to the charge by a large majority of the town-council, and inducted on 21 July 1815. In the month of November fol-

lowing he commenced his series of astronomical discourses, in accordance with a custom observed in Glasgow, of the city ministers delivering in rotation a course of sermons in the Tron Church on Thursdays. These created a sensation such as no sermons had ever before produced in Glasgow. It is related, that when the hour of delivering them arrived, merchants and men of business would regularly leave their desks and proceed to the Tron Church, while the more liberal among them would, in addition, grant a similar indulgence to their clerks and assistants. In the commencement of 1817 these discourses were published, and attained a sale of nearly 20,000 copies by the end of the year. They raised their author to the position of the first preacher of the day, and in a visit which he shortly afterward paid to London, the most distinguished literati and statesmen crowded to listen to the wondrous oratory of the Scottish divine.

The main object which engaged Chalmers on his arrival in Glasgow was the reorganizing of the parochial system, so as to provide a machinery by which the destitute and outcast might be visited and reclaimed, and the young instructed in the lessons and duties of religion. Especial efforts were directed toward the establishment of Sabbath-schools. Great exertions were also made by him to get new churches erected throughout Glasgow, the church accommodation for which comprehended scarcely a third of the inhabitants. In this he ultimately succeeded, and in addition, a new parish and church (St. John's) were erected and endowed expressly for himself by the town-council of Glasgow. To this he was in 1819 transferred from the Tron. The fatigues, however, which unremitting attention to parochial affairs involved were becoming too much for his health, and on the vacant chair of moral philosophy, in the University of St. Andrews, being offered to him, he accepted it.

In 1827 the divinity chair in the University of Edinburgh became vacant, and Chalmers was unanimously elected to it by the town-council 31 October. This appointment he held till the disruption of the Scottish Church in 1843. In 1832 he published his 'Political Economy,' and shortly afterward appeared his contribution to the celebrated Bridgewater Treatises, 'On the Adaptation of External Nature to the Moral and Intellectual Constitution of Man.' In 1834 he was elected a corresponding member of the Royal Institute of France. An important matter which now largely engaged his attention was the subject of church extension, which he had zealously advocated from the days of his ministry in Glasgow. But Lord Melbourne's government was little disposed to aid the Church of Scotland on this occasion, and it was consequently obliged to carry out its scheme on the voluntary principle. Amid the various public movements with which Chalmers' name stands connected, there is none in which it more prominently occurs than in relation to the great non-intrusion movement in the Scottish Church. Throughout the whole of this memorable contest, from the passing of the veto law by the General Assembly to the Disruption in 1843, he acted as the leader of the Evangelical party in their struggles with the civil power, and may be regarded as the founder of the Free Church, of the first assembly of which he was

CHALONS-SUR-MARNE — CHALYBEATE WATERS

moderator. He was also the originator of the sustentation fund, out of which the ministers of that body are principally supported. Having vacated at the Disruption his professorial chair in the Edinburgh University, he was appointed, on the establishment of a new college in connection with the Free Church, to the offices of principal and primarius professor of divinity in that institution. The energy which made Chalmers remarkable as an orator was infused into all his practical undertakings; and in the social and religious movements which he inaugurated he has left his mark in the history of his country. His published works are very numerous, embracing sermons, tracts, essays, works on political economy, the parochial system, church establishments, etc. They exhibit the same energy of conviction, together with a breadth and profundity of view, which, though many of his theories have not been accepted by other thinkers, will always make them a rich mine of suggestion and instruction to inquirers into the complicated relations of human society. See 'Lives,' by Hanna (1849-52); Fraser (1881); Mrs. Oliphant (1893); Blaikie (1897).

Châlons-sur-Marne, shâ-lôn sür mârñ, France, a city and capital of the department Marne (Champagne), 107 miles east of Paris. It lies on the right bank of the Marne, here crossed by a stone bridge of three arches, built in 1787. Low walls now supply the place of the old ramparts, the entrance being by six gates, which open to six main roads. The principal public buildings are the cathedral, restored by Louis XIV. after having been destroyed by fire in the 13th century; the church of Notre Dame, of the 12th and 13th centuries, and since restored; the Hotel de Ville, built in 1772; the Hotel de la Prefecture, built in 1764, one of the finest buildings of the kind in France; public library, containing 30,000 volumes; museum, hospital, etc. There is a promenade, occupying about 18 acres, formerly planted with superb elm trees, which the Germans cut down for fuel during the Franco-Prussian War. Châlons is the seat of a bishopric, and of one of the schools of arts and trades, where 300 pupils are maintained and instructed at the public expense. There are manufactures of woolen and cotton goods; cotton mills, tanneries, etc. Châlons was fortified and embellished by the Romans. Christianity was preached here about the year 250. In 451 Attila was defeated before its walls. From the 10th century it formed a kind of independent state, governed by its bishops, till 1360, when it was united to the crown. A celebrated camp was established by Napoleon III. at the distance of about 18 miles from Châlons for the purpose of training the French troops. In 1870 the town was occupied by the Germans after MacMahon's withdrawal. Pop. (1903) about 27,000.

Châlon-sur-Saône, sür sôn, France, a town in the department of Saône-et-Loir, 33 miles north of Macon, at the commencement of the Canal du Centre. It is situated on the Saône, here crossed by a bridge of five arches, communicating with the suburb of St. Laurent. It is irregularly built, and is surrounded by a wall and the remains of ancient fortifications. The public buildings include the church of St. Vincent, built in 1386-1440, a library with 22,000

volumes, a gallery of painting, etc. Châlon is the seat of a tribunal of first resort and of commerce, and has a communal college. There are foundries, dye-works, manufactories of leather, cloth, glass, etc., and a considerable trade in grain, flour, and wines. The Saône becomes navigable for steamboats here, and there is steamer connection with Lyons. Cæsar had grain magazines at Châlon, and it became the capital of Burgundy under Gontran. In 1273 Edward I. of England, being invited to a tournament here on his return from Palestine, attended with 1,000 men-at-arms; and some disputes having arisen, the English attacked the French, killed a great number, and left the tilting-ground strewn with the dead. This event is known as "the little war of Châlon." The town suffered considerably from the civil wars of the 15th and 16th centuries, and from the invasion of the allies in 1814. Pop. (1896) 26,630.

Chalybeate (ka-lib'ē-āt) **Waters**, those which contain salts of iron in sufficient quantity to give them a special value in the treatment of cases of anæmia, etc. Iron or steel waters are not the only mineral waters in which some form of iron is found. Indeed in nearly all this ingredient exists, but in very many in such small quantity, while other ingredients are so conspicuous, that the character of the water can hardly be supposed to be affected by that metal. Those springs most successfully resorted to contain from one third to nine tenths of a grain of iron, in the form of carbonate, in 16 ounces. Some springs are classed as iron springs which contain barely one fifth of a grain in 16 ounces of water. What are called pure iron springs are those which contain but a few grains of dissolved solids, a salt of iron existing to some appreciable amount; compound iron springs contain moderate quantities of other salts, such as Epsom and Glauber's salts, common salt, sulphate of lime, besides being rich in carbonic acid gas. The reason for the use of iron waters is that iron is a necessary ingredient of the blood, and in certain conditions promotes the formation of blood. Small doses only should be employed, as excess may irritate the stomach and bowels and produce constipation. It has been found that iron springs are most useful in cases of poverty of blood quickly produced, for example, by loss of blood by bleeding from the nose, or from wounds; by drain occurring from the blood, owing to diarrhœa, suppuration, and other profuse discharges; in cases of chlorosis in young girls; and in poverty of blood dependent on acute disease, in which cases they materially promote convalescence. Iron springs are also used in disorders of menstruation, especially in its suppression; in malarious conditions and poverty of blood due to residence in tropical countries; and in neuralgia, sterility, and impotency due to enfeebled conditions of general health. In such cases as these last the improvement is not so rapid, and is often best promoted by waters which, besides the iron, contain marked quantities of other ingredients, like common salt. It is chiefly in the form of carbonate that the iron exists, and this is the best form for administration. The presence of carbonic acid gas in the water keeps the carbonate of iron in solution, and when the water

CHALYBITE — CHAMBERLAIN

stands a yellowish rust is deposited. Iron springs are used for bathing, but it is not now believed that the iron produces any effect on the skin or is absorbed from the bath. Among the chief chalybeate springs are those at Saratoga, N. Y.; two at Harrogate, England, called the Muspratt and the Tewitt, the latter pure; a pure one at Tunbridge Wells; several at Bath; one at Bocklet, near the salt spring of Kissingen, containing much common salt and carbonic acid gas; those of Antogast, Freiersbach, Griesbach, Petersthal, and Rippoldsau, in the Black Forest region, at altitudes of from 1,280 to 1,886 feet; one at Orrezza, in Corsica, with much carbon dioxide and traces of arsenic; many at Spa; one at St. Moritz, Switzerland, situated at an elevation of 5,710 feet; one at Santa Catarina, Italy, three miles from Bormio, at a height of 5,600 feet; several very popular pure ones at Schwalbach in Nassau; one at Pyrmont, Waldeck; and one at Cheltenham, with a very high proportion of iron carbonate.

Chalybite, käl'i-bīt, or **Siderite**, a common iron ore. It is iron protocarbonate, FeCO_3 , containing 48.2 per cent of metallic iron. It occurs in rhombohedral crystals, also botryoidal, globular, compact or earthy, but most commonly cleavable-massive. Its hardness is 3.5 to 4, but in the siliceous variety, clay iron-stone, found in many coal formations, it sometimes runs up to 7. Its specific gravity is about 3.85, lustre vitreous to pearly, color usually brown or yellowish-gray. It is generally nearly opaque. It occurs in enormous quantities in Austria, also at Roxbury, Conn. It is a frequent associate of silver, lead, and copper ores. Clay iron-stone is considered the most important iron ore of England.

Cham, shän (pseudonym of AMÉDÉE DE NOÉ), French caricaturist: b. Paris 26 Jan. 1819; d. 6 Sept. 1879. He adopted the name Cham (Ham) as one of the sons of Noah, his father being M. de Noé (Noah). The son of a peer of France, he attended the polytechnic school; but following his artistic inclinations, became a pupil of Delaroche and Charlet, and acquired distinction as a caricaturist by his spirited and humorous contributions to the Paris 'Charivari,' and by the publication of several collections of caricatures, among the best of which are 'Annee's Comiques' (1880); 'Les Folies Parisiennes' (1883).

Chama, kā'ma, a genus of mollusks, the typical one of the family *Chamidae*. The shell has foliaceous valves, the upper one the smaller, one valve attached to another body by the left umbo; the hinge tooth of the free valve is received between two teeth of the other. The chamas are found less than 50 fathoms deep in tropical seas, especially among coral reefs. Fifty recent species are known, and 40 fossil, the latter from the Cretaceous onward. The still existing *Chama gigas* sometimes weighs 300 pounds, and may measure four feet across. The byssus by which it adheres to the rock is so tough that a hatchet is required to cut it through. One valve is sometimes used in churches as a baptismal font.

Chamærops, ka-mē'rōps, a genus of palms established by Linnæus, and remarkable as containing those species of the palm family which are found at the greatest distance from the equator. It is characterized by its flabelliform

leaves, polygamous and sometimes dioecious flowers, and its triple monospermous drupes. The *C. humilis* is the only palm which is seen growing in the open air in any part of Europe. It is confined, however, to its hottest parts, and even there is generally only from four to five feet high. Its trunk, from five to six inches in diameter, is closely covered with triangular hard scales, the bases of the old leaves; the new leaves grow in a tuft at the top. Sometimes the stem does not appear at all; and the leaves, apparently issuing from the ground in the form of a large fan, have procured for the plant the name of the fan-palm. In hot-houses the stem attains the height of 15 feet or more. The leaves are used for thatch and other purposes, and they furnish a large quantity of fibre, which forms an article of commerce and yields a material that may be used instead of horse-hair. *C. fortunei*, a species from northern China, stands the climate of southern England quite well. Brazilian grass is a fibre obtained from *C. argentea*.

Chamalari, chä-mä-lä'rē, or **Chamalhari**, a peak of the Himalaya Mountains, at the western extremity of the boundary line between Bhutan and Tibet. Height, 23,929 feet.

Chamba, chām'ba, a state of the Punjab district, British India, north of the districts of Kangra and Gurdaspur; area 3,216 square miles. It is a mountainous tract, shut in on almost every side and traversed by two hill-ranges. The crops consist of all kinds of grain and the supply of iron and slate is plentiful. The sanitarium of Dalhousie is in this district. Pop. 130,000.

Chambal, chūm'būl, a river in Rajputana, Central Provinces of British India, flowing into the Jumna; length, 750 miles.

Chamber, a term having various technical meanings. The chamber of a cannon is that part of the bore of a cannon which receives the powder with which it is charged. The chamber of a mine is the place where the charge of powder is lodged that is to be used for blowing up the works. In several languages chamber is used to designate a branch of government whose members assemble in a common apartment. A chamber of commerce is a board or association to promote the interests of the trade and merchandise. See CHAMBERS OF COMMERCE.

Chamberlain, Abiram, American governor: b. Colebrook, Conn., 7 Dec. 1837. He was educated in the public schools and at Williston Seminary, Easthampton, Mass., making a special study of civil engineering. In 1856 he removed to New Britain, Conn., where he learned the trade of rule-making and practised civil engineering with his father. He was teller of the New Britain National Bank for five years, cashier of the Home National Bank of Meriden, 1867, and its president since 1881. He has held local municipal offices, was a member of the General Assembly, 1877, comptroller 1901-2, and governor of Connecticut, 1903-4.

Chamberlain, Alexander Francis, American anthropologist: b. Kenninghall, England, 12 Jan. 1865. He was graduated at Toronto University in 1886, and became a member of numerous learned societies. Since 1892 he has been lecturer on anthropology at Clark Uni-

CHAMBERLAIN

versity, Worcester, Mass. He has written 'The Child and Childhood in Folk-Thought' (1896); 'The Child; a Study in the Evolution of Man' (1900); and many essays on similar topics.

Chamberlain, Basil Hall, English Japanese scholar: b. Southsea 18 Oct. 1850. He is a grandson of Basil Hall (q.v.). He is emeritus professor of Japanese and philology at the Imperial University of Tokyo, and has published 'The Classical Poetry of the Japanese' (1880); 'Translation of the Kojik' (1883); 'A Romanized Japanese Reader' (1886); 'Language, Mythology, and Geographical Nomenclature of Japan in the Light of Aino Studies' (1887); 'Luchuan Grammar' (1895); 'Handbook of Colloquial Japanese'; 'Things Japanese.'

Chamberlain, Daniel Henry, American lawyer: b. West Brookfield, Mass., 23 June 1835; d. 13 April 1907. He graduated at Yale in 1862, and at Harvard Law School in 1863. In 1864 he was commissioned lieutenant in the 5th Massachusetts colored cavalry, served in Maryland, Louisiana, and Texas, and was promoted captain. In 1866 he settled as a cotton planter in South Carolina. Upon the call for a constitutional convention, he was chosen a delegate, and was subsequently elected attorney-general, a position he held for four years. From 1872 to 1874 he practised law at Columbia, S. C. He was governor of the State 1874-7. Though renominated in 1876 and re-inaugurated in January 1877, his election was contested by Wade Hampton, the Democratic candidate for governor. After the inauguration of President Hayes, both contestants were invited to a conference at Washington, which resulted in the U. S. troops (which had been sent to support Chamberlain) being withdrawn from South Carolina, and Gov. Chamberlain withdrawing his claim to election. He resumed law practice in New York city until his retirement to West Brookfield, Mass. He has published several addresses and pamphlets, the latest of which is 'Charles Sumner and the Treaty of Washington' (1902).

Chamberlain, Henry Richardson, American journalist: b. Illinois 25 Aug. 1859. He engaged in journalism in Boston and New York, being managing editor of the *New York Press* in 1888, and of the *Boston Journal* in 1891, and since 1892 has been London correspondent for the *New York Sun*. He has published 'Six Thousand Tons of Gold' (1894).

Chamberlain, J. Austen, English politician, son of Joseph Chamberlain, (q.v.): b. 1863. He was educated at Rugby, and Trinity College, Cambridge. He was Civil Lord of the Admiralty 1895-1900, financial secretary to the Treasury 1900-2, postmaster-general 1902-3 and since 1903 has been chancellor of the exchequer.

Chamberlain, Jacob C., American missionary: b. Sharon, Conn., 13 April 1835. He graduated at Western Reserve College 1856; studied at the Dutch Reformed Church theological seminary 1859, and also took a medical degree at the College of Physicians and Surgeons in New York. In December 1859, he went as a medical missionary to southern India, and has resided in the Madras presidency ever since, with the exception of three visits to the

United States. He established a hospital and dispensary at Madanapalli 1868, and another at Palamanair 1872. He translated the Reformed Church liturgy into Telugu Madras 1873), and also 'Hymns for Public and Social Worship' (1884). He has written 'The Bible Tested' (1878; 7th ed. 1885); 'Native Churches and Foreign Missionary Societies' (1879); 'Winding up a Horse; or Christian Giving' (1879); 'Break Coconuts Over the Wheels: or All Pull for Christ' (1885).

Chamberlain, Joseph, English statesman: b. London July 1836. He was educated at University College School, and entered his father's screw factory at Birmingham, from which, however, he retired in 1874. He had by this time acquired considerable celebrity as a Radical politician. In 1868 he was appointed a member of the Birmingham town-council, was mayor of Birmingham from 1873 to 1876, and chairman of the Birmingham school-board from 1874 to 1876. After unsuccessfully contesting Sheffield against Mr. Roebuck in 1874, he was returned for Birmingham without opposition in June 1876. He soon made his mark in Parliament, and on the return of the Liberals to power in 1880 was appointed president of the Board of Trade, with a seat in the cabinet. To Mr. Chamberlain's exertions was due the passing of the Bankruptcy Bill, but his efforts to amend the Merchant Shipping Acts were unsuccessful. Meanwhile his influence was increasing rapidly outside the House; he came to be regarded as the leader of the extreme Radical party, and enunciated schemes for the regeneration of the masses which were based on the doctrines of the "restitution" of land and the "ransom" of property. During the last hours of Mr. Gladstone's government he was understood to be opposed to the renewal of the Irish Crimes Act; and during the general election of 1886 he was most severe in his strictures on the moderate Liberals, and produced an "unauthorized" programme (in opposition to that of Mr. Gladstone), which included the readjustment of taxation, free schools, and the creation of allotments by compulsory purchase. He was returned free of expense by the western division of Birmingham. On 1 Feb. 1886 he became president of the Local Government Board, but resigned on 26 March, because of his strong objections to Mr. Gladstone's Home Rule measures for Ireland, and after the "Round Table" conference had failed to reunite the Liberal party he assumed an attitude of uncompromising hostility to his old leader's new policy, and was bitterly assailed by Home Rulers as a renegade. He became leader of the Liberal-Unionists when the Duke of Devonshire went to the Upper House. Lord Salisbury sent him to Washington as commissioner on the Canadian fishery dispute, and from 1895-1903 he was colonial minister in the Unionist Cabinet.

In that capacity his chief aim was to unite more closely the colonies with the mother country. During his tenure of office he had various difficult matters to handle, such as the negotiations concerning the "Jameson raid" on the Transvaal in December 1895, and the French claims in West Africa. On news of the "raid" being received, Mr. Chamberlain at once repudiated all connection with it on the part



MR. JOSEPH CHAMBERLAIN.

CHAMBERLAIN

of the British authorities; and he subsequently denied in the most distinct manner having had any personal foreknowledge or suspicion of what was about to take place. His conduct of the negotiations with the South African Republic preceding the outbreak of war in 1899 met with enthusiastic support from many and severe censure from others. Since the conclusion of the Boer war he has visited South Africa and by his personal influence done much to bring about a good understanding between the Boers and the English government. He had much to do with the passing of the Workmen's Compensation Act of 1897. In 1896 the students of Glasgow University elected him lord rector. He carried the Australian Federation measure in Parliament (1900). In 1888 he was married to Mary, daughter of William C. Endicott, secretary of war in President Cleveland's first administration. He resigned from the Cabinet in 1903, owing to his pro-tariff views. In 1906 he was returned to Parliament from Birmingham.

Chamberlain, Joshua Lawrence, American soldier and educator: b. Brewer, Me., 8 Sept. 1828; graduated Bowdoin College 1852, and Bangor Theological Seminary 1855; received the honorary degree of LL.D., Pennsylvania College, 1866, and from Bowdoin College 1869. Professor of rhetoric and oratory, Bowdoin, 1856, and in 1861 professor of modern languages of Europe. On 8 Aug. 1862, he entered the army as lieutenant-colonel of volunteers, and served through the Civil War in the Army of the Potomac, in every campaign and nearly every great battle from Antietam to Appomattox, and was several times wounded, twice severely. He received the Congressional Medal of Honor for his remarkable conduct in the defense of Round Top, Gettysburg, 2 July 1863, and was advanced to the command of a brigade. On 18 June 1864, he was promoted brigadier-general on the field by Gen. Grant for distinguished gallantry in leading a desperate charge, and early the following spring he received a special promotion as brevet major-general, "for conspicuous gallantry in action." In the campaign of 1865 he commanded two brigades of the first division, Fifth corps. "In the last action at Appomattox Court House," his corps commander says in an official report: "Gen. Chamberlain had the advance, and was driving the enemy rapidly before him when the flag of truce came in." At the formal surrender he was assigned to command the parade before which the Confederate army laid down their arms and colors. He was shortly assigned to the command of the 1st division, and held that position until the disbandment of the Army of the Potomac. In the order disbanding that army he was retained in the service and assigned to a command in the special corps intended to be sent to Mexico under Sheridan. He was afterward offered a colonelcy in the regular army, but the condition of his wounds induced him to decline the service, and in January 1866 he returned to Maine.

In the autumn of that year he was elected governor of Maine, and served in that office for four terms. He immediately set about the task of settling the complicated accounts of the State with the national government for expenses of raising troops for the war for the Union. Under his vigorous initiative the industrial in-

terests of the State took a fresh start. Among the measures which marked his administration were the settlement of the joint claim of Massachusetts and Maine for expenses of troops for the War of 1812, and the application of the avails to the opening of the European & North American Railway; the establishment of the Swedish colonies in Aroostook County, the results of which have been remarkable, and the 'Survey and Report on the Water Power of Maine, which stimulated great extension of manufacturing industries. In 1871 he was chosen president of Bowdoin College, and continued in this position for 12 years. His administration was marked by a broadening of the course and a large increase in the resources of the college, due largely to his personal efforts. During this time he also held successively the chairs of Political Economy, Mental and Moral Philosophy and Public Law. In the course of this time he was elected major-general of Maine, and assigned to command the entire militia of the State. In 1880 when for a time there was no active or legal State government, he was called to the capital "to preserve the peace and institutions of the State." This he accomplished without the use or show of military force. In 1885 he went to Florida and engaged in the work of railroad building and public improvements on the West Coast. He was U. S. Commissioner to the Universal Exposition at Paris in 1878, and his report on education met with marked favor on the part of the French government. He was orator at the founding of the Loyal Legion in Philadelphia in 1866, and also at the formation of the Society of the Army of the Potomac in 1869, and has been commander in both these associations, as well as in the Grand Army. He is much sought for as writer and orator; some of his published papers are the article "Maine" in the 'Encyclopedia Britannica'; his centennial address (1876); 'Maine, Her Place in History'; 'Ethics and Politics of the Spanish War' (1898); 'De Monts and Acadia' (1904). He is at present surveyor of the port of Portland, Maine.

Chamberlain, Mellen, American lawyer: b. Pembroke, N. H., 4 June 1821; d. Chelsea, Mass., 25 June 1900. He graduated at Dartmouth College in 1844, and at the Harvard Law School in 1848. In 1849 he was admitted to the bar, opened a law office in Boston, and made his residence in Chelsea, where, during 51 years of citizenship, he served the town in many public capacities. In 1858 and 1859 he was a member of the Massachusetts House of Representatives, and of the Senate in 1863-4. He was associate justice of the municipal court of Boston 1866-70, and chief justice 1870-8. On 26 Aug. 1878 he was chosen librarian of the Boston Public Library, serving until ill health compelled his retirement in 1890. During his administration the new library building was begun, and the corner-stone laid. Throughout his life he was a close student and investigator of American history. Besides important chapters in Winsor's 'Memorial History of Boston' (1881), and 'Narrative and Critical History of America' (1888), he wrote: 'John Adams, the Statesman of the Revolution' (1884); 'The Authentication of the Declaration of Independence' (1885); 'John Adams, the Statesman, with Other Essays and Addresses' (1898).

CHAMBERLAIN — CHAMBERLIN

Chamberlain, Montague, American naturalist: b. St. John, New Brunswick, 5 April 1844. He was educated privately, both his parents being teachers. Though engaged in mercantile pursuits, he devoted much time to the study of natural history and came to be well known as an ornithological writer. In 1889 he became assistant secretary of the Lawrence Scientific School of Harvard University, and since 1893 has been secretary. He is a member of several scientific bodies, and his chief publications are: 'Canadian Birds' (1870); 'Birds of New Brunswick' (1882); 'Mammals of New Brunswick' (1884); 'Systematic Table of Canadian Birds' (1887); 'Birds of Greenland' (1892); 'Some Canadian Birds' (1895); 'Maliseet Vocabulary' (1899); 'The Penobscot Indians' (1899).

Chamberlain, Nathan Henry, American clergyman: b. Bourne, Mass., 25 Dec. 1830; d. there 1 April 1901. He graduated at Harvard, 1853, and studied theology at the divinity school there, and at Heidelberg, Germany, eventually becoming a Unitarian minister. He was pastor at Canton, Mass., 1857-9, and at Baltimore, Md., 1860-3. He then took orders in the Episcopal Church, and became rector at Birmingham, Conn., 1864-7; Morrisania, N. Y., 1868-71; Milwaukee, Wis., 1871-3; Somerville, Mass., 1874-9; East Boston, Mass., 1882-9. He then retired to devote himself to literary pursuits. His books are: 'Autobiography of a New England Parish' (1864); 'The Sphinx in Aubrey Parish' (1889); 'What is the Matter with our Tariff and its Taxes' (1890); 'Samuel Sewall and the World He Lived In' (1897), an admirable study of colonial life in New England; 'Life of Sir Charles Napier'; 'An Itinerary of Cape Cod.'

Chamberlain, Thomas Crowder, American geologist: b. Mattoon, Ill., 25 Sept. 1843. He was educated at Beloit College and the University of Michigan; was professor of natural sciences in Whitewater Normal School, Wis., 1869-73; professor of geology at Beloit College 1873-82; president of the University of Wisconsin 1887-92; and has been dean of the scientific faculty of the University of Chicago from 1892. He was assistant State geologist of Wisconsin 1873-6, and State geologist from 1876. He is the author of 'Geology of Wisconsin' and of many important papers printed by the United States Geological Survey.

Chamberlain, a court officer, originally employed, as the name indicates, to take charge either of the private apartments of a prince, or of a treasury, called in the 10th century *camera* (whence the word chamber). The golden key, which is worn by the chamberlains of the European courts on two small golden buttons (as well as the buttons themselves, when the key is omitted), indicates also the origin of the office. At present the employment of chamberlains (when their office is not merely nominal) is to attend on the persons of the princes and their consorts. There is generally a chief or high chamberlain. This officer in England is called Lord Great Chamberlain of England. His office is one of great antiquity and honor, being ranked as the sixth great office of the English crown. To him belongs lodging and

livery at the king's court; and there are certain fees due to him from each archbishop and bishop when they perform their homage to the king; and from all peers at their creation, on doing their homage. At the coronation of the sovereign, he has an allowance of 40 ells of crimson velvet for his own robes. This officer, on the coronation day, is to bring the king his shirt, coif, and wearing apparel, and after the king is dressed, he claims his bed and all the furniture of his chamber for his fees; he also carries at the coronation the coif, gloves and linen to be used by the king on that occasion; also the sword and scabbard, the gold to be offered by the king, and the robes royal and crown; he dresses and undresses the king on that day, waits on him before and after dinner, etc. To this officer belongs also the care of providing all things in the House of Lords, in the time of the Parliament; the government of the palace of Westminster; and he disposes of the sword of state to be carried before the king, to what lord he pleases. The office of Lord Great Chamberlain of England is hereditary; and where a person dies when in fee of this office, leaving two sisters, the office belongs to both, and they may execute it by deputy, but such deputy must be approved of by the king, and must not be of a degree inferior to a knight. The keys of Westminster Hall and the Court of Requests are delivered to the Lord Chamberlain on all solemn occasions. He goes on the right hand of the sword, next the king's person. The Gentleman Usher of the Black Rod, Yeoman Usher, etc., are under his authority.

The *Lord Chamberlain of the Household* is an officer who has the oversight and direction of all the officers belonging to the king's chambers, except the precinct of the king's bed-chamber. He has the oversight of the officers of the wardrobe at all His Majesty's houses, and of the removing of wardrobes, or of beds, tents, revels, music, comedians, hunting, messengers, etc., retained in the king's service. He moreover has the entire oversight and direction of the sergeants-at-arms, of all physicians, apothecaries, surgeons, barbers, the king's chaplains, etc., and administers the oath to all officers above stairs.

The *Chamberlain of London* keeps the city money which is laid up in the chamber of London; he also presides over the affairs of masters and apprentices, and makes free of the city, etc. His tenure of office only lasts a year, but the custom usually is in order, to rechoose the same person, unless charged with any misdemeanor in his office.

At all monarchical courts there are almost as many different chamberlains as there are kinds of chambers; the English chamberlains here cited, and their duties, may be taken as typical.

Chamberlin, Joseph Edgar, American journalist: b. Newbury, Vt., 6 Aug. 1851. Until 1890 he was on the staffs of papers in Newport, R. I., Fall River, Mass., Chicago, and Boston. From 1891 to 1898 he was assistant editor of the 'Youth's Companion,' an essayist and magazine writer. During the Spanish war he was war correspondent of the New York *Evening Post* in Cuba. He has published: 'The Lis-

CHAMBERS

tener in the Town'; 'The Listener in the Country.'

Chambers, chām'bèrz, Charles Julius, American journalist and novelist: b. Bellefontaine, Ohio, 21 Nov. 1850. In 1870 he traveled through the West Indies, Europe, the United States, and Canada, as special correspondent of the *New York Herald*. In 1876 he published an account of his few weeks of experience (incognito) in an insane institution, entitled, 'A Mad World,' which excited great interest. He has also published several novels: 'On a Margin'; 'Lovers Four and Maidens Five'; 'Chats on Journalism'; 'Missing'; 'The Rascal Club'; 'One Woman's Life.'

Chambers, Edward Thomas Davies, Canadian journalist: b. Saffron Walden, Essex, England, 1852. He removed to Canada in 1870, and after teaching a short time entered journalism, becoming chief editor of the *Quebec Daily Chronicle* in 1897. He has published 'The Port of Quebec' (1890); 'The Haunts of the Ouaniche' (1891); 'Quebec: Ancient and Modern' (1892); 'Quebec, Lake Saint John and the Saguenay' (1893); 'Chambers' Guide to Quebec' (1895); 'The Book of the Ouaniche and its Canadian Environment' (1896).

Chambers, Ephraim, English miscellaneous writer, and compiler of a popular 'Dictionary of Arts and Sciences': b. Kendal, Westmoreland, about 1680; d. 15 May 1740. On leaving school he was apprenticed to a mathematical instrument and globe maker in London. Here he acquired such a taste for the study of science, and made so much proficiency in it, that he not only formed the design of compiling his famous 'Cyclopædia,' but actually wrote some of the articles for it behind his master's counter. The first edition of this work was published in 1728, and Chambers was soon after chosen F.R.S. Two subsequent editions, in 1738 and 1739, appeared previously to his death. A French translation of the 'Cyclopædia' was the basis of the 'Encyclopédie' of Diderot and D'Alembert. A revised and enlarged edition was brought out first by Scott and Hill, and afterward, 1781-6, by Dr. Rees, who latterly built up on it the work known by his own name.

Chambers, George Frederick, English publicist: b. 18 Oct. 1841. He was educated at King's College, London, and has filled various public appointments. Besides editing various legal text-books, guides to Sussex, etc., he is the author of 'Hand-book of Descriptive and Practical Astronomy'; 'Pictorial Astronomy' (1891); 'The Story of the Sun, Stars, Eclipses, Weather' (1896-9), etc.

Chambers, Robert, Scottish prose-writer and publisher: b. Peebles 10 July 1802; d. Saint Andrews 17 March 1871. He and his brother William began in poverty as small booksellers; issued penny leaflets of useful information for the people, written in a clear and simple though not infantile style, which became very popular, and at last took regular periodical form in 'Chambers' Journal,' and the great publishing-house which bears the name of both developed gradually. The 'Chambers' Encyclopædia for the People' was the outgrowth of the 'Journal,' and edited by the brothers. Robert wrote also 'Traditions of Edinburgh'; 'History of the British Empire'; 'Domestic Annals of Scotland';

'The Book of Days'; 'Cyclopedia of English Literature'; 'Ancient Sea Margins'; etc., but his most noted book was the anonymous 'Vestiges of Creation.'

Chambers, Robert William, American artist and novelist: b. Brooklyn, N. Y., 26 May 1865. He has written: 'In the Quarter' (1893); 'The King in Yellow' (1893); 'The Red Republic' (1894); 'A King and a Few Dukes' (1894); 'The Maker of Moons' (1895); 'Oliver Lock'; 'The Mystery of Choice' (1896); 'Lorraine' (1896); 'The Red Republic' (1896); 'Ashes of Empire' (1897); 'The Haunts of Men' (1898); 'The Cambric Mask' (1899); 'Outsiders' (1899); 'The Conspirators' (1900); 'Cardigan' (1901); 'The Maid at Arms' (1902); 'The Maids of Paradise' (1903); and 'With the Band,' a volume of ballads.

Chambers, Talbot Wilson, American clergyman: b. Carlisle, Pa., 25 Feb. 1819; d. New York 3 Feb. 1896. He graduated at Rutgers, 1834; studied theology at the Reformed Church Seminary there, and also at Princeton. He was pastor of the Reformed Dutch Church in Somerville, N. J., 1839-49. In 1849 he was installed a pastor of the Collegiate Dutch Church in New York, and remained in association with the Middle Dutch Church congregation until his death. He was a member of the American Bible Revision Committee, and for many years chairman of the committee on versions of the American Bible Society. He wrote: 'The Noon Prayer Meeting in Fulton Street' (1857); 'Memoir of Theodore Frelinghuysen' (1863); 'Exposition of the Book of Zechariah' (1874), in 'Lange's Commentary'; 'The Psalter a Witness to the Divine Origin of the Bible' (1875); 'Companion to the Revised Version of the Old Testament' (1885).

Chambers, Sir William, English architect: b. of Scottish parents, Stockholm, Sweden, 1726; d. London 8 March 1796. He was educated at Ripon, in Yorkshire, and while very young went as supercargo to the East Indies, resided for some time in China, and brought back many drawings of Chinese buildings and costume, which were afterward published. He then devoted himself to the study of architecture, and on returning from travels in France and Italy was appointed drawing master to the Prince of Wales, afterward George III. He laid out the royal gardens at Kew in the Chinese style, and built the villa of the Earl of Besborough at Roehampton, in the Italian style, a mansion for Lord Abercorn, near Edinburgh, and houses for Lord Melbourne and the Earl of Gower, at Whitehall and in Piccadilly. His masterpiece was Somerset house in London, which he rebuilt in 1775. He published in 1759-68, a 'Treatise on Civil Architecture'; in 1772, a 'Dissertation on Oriental Gardening.'

Chambers, William, Scottish publisher and miscellaneous writer: b. Peebles 16 April 1800; d. Edinburgh 20 May 1883. He was a brother of Robert Chambers (q.v.). He published 'Things as They Are in America' (1853), 'American Slavery and Color' (1857); 'France: Its History and Revolutions' (1871); 'Stories of Old Families,' etc. In 1859 he bestowed on his birthplace the commodious suite of buildings known as the Chambers Institute, comprising a library, reading-room, lecture-room, art-gallery, and museum. Of his native county he published

CHAMBERS OF COMMERCE — CHAMBORD

a history in 1864. In 1865 he was elected Lord Provost of Edinburgh, in which capacity he organized and carried out many extensive and useful measures of sanitary improvement. Between 1871 and 1883 he spent upward of \$100,000 on the restoration of St. Giles' Cathedral, Edinburgh.

Chambers of Commerce, associations formed by tradesmen and merchants for the purpose of protecting and furthering the commercial interests of the community to which the chamber belongs. Among the various methods employed to promote the ends of such associations are the following: The influence of legislative action for the benefit of commerce, the collection of trade statistics, the gaining of economical or other advantages, by combination, the settlement by arbitration of mercantile disagreements. The oldest body of the nature of a chamber of commerce was started in Marseilles at the close of the 17th century. The value of such bodies became apparent and they sprang up rapidly throughout the civilized world. In mediæval Venice and in the Hanse towns they do not seem to have existed in the sense in which they are understood to-day. The first institution of the kind in the United States, the New York Chamber of Commerce, was organized in 1768 and incorporated by royal charter from King George III. in 1770. There are similar bodies in every city and town of consequence in the United States. The oldest Chamber of Commerce in Great Britain, that of Glasgow, dates from 1783. Edinburgh followed two years later, and for long held a leading position, but the most important British chamber of commerce at the present time is that of London, founded so lately as 1881. It has instituted a series of examinations in commercial subjects, and lectures are delivered under its auspices. Junior and senior commercial certificates are granted after examination to those who display the amount of knowledge required. In 1860 there was formed an Association of Chambers of Commerce of the United Kingdom, which holds annual meetings in London. It includes nearly 100 chambers.

The extension of the functions of chambers of commerce in the United States has been considerable in the decade between 1890 and 1900. The movement had its origin in Germany and grew out of the organized efforts of the last 20 years to foster the world commerce of the empire. The chambers of commerce in leading cities like Berlin and Hamburg undertook the commercial training of young men, with a view to their future advancement in mercantile life and the consular service. The result was the securing of a higher order of talent in such pursuits. The hint thus thrown out was promptly taken up in the United States. The New York Chamber of Commerce, in 1899, voted a fund for the endowment of a lecture course on commerce at Columbia University; in Chicago a chair of commerce was established by that city's chamber at the University of Chicago, and in August 1900 a School of Commerce, Accounts, and Finance was established by the University of New York. Students were assured in the event of a satisfactory course of study, that they would be given posts in leading commercial establishments or appointed to consular offices so far as influence could attain that

result. The movement is destined to mark a new era in the influence of chambers of commerce.

Chambersburg, Pa., a borough and county-seat of Franklin County, on the Conococheague and Falling Creeks and the Cumberland Valley and W. and the Philadelphia & R. R.R.'s, 49 miles west-southwest of Harrisburg. In Early's raid in the Civil War Gen. McCausland entered Chambersburg with Confederate cavalry, 30 July 1864, and demanded a tribute of \$100,000 gold; this not being paid the place was set on fire and two thirds of it burned, causing a loss of \$1,000,000. It was soon rebuilt, chiefly of brick or stone, and is now the seat of Wilson College for women, and has an academy, several churches and newspapers, public schools, manufactories, machine shops, two national banks, and an assessed property valuation of \$3,000,000. In the environs blue limestone, freestone, and marble abound. Pop. (1900) 8,864.

Chambertin, shän'-bër-tän, a superior red Burgundy wine, named after the place where it is produced, in the department of Côte d'Or.

Chambéry, shän-bā-rē, France, capital city of the department of Savoy, at the junction of two small rivers, near the Isère, between two mountains on the border of a fertile plain. It is an archbishop's see, and contains a cathedral, six hospitals, a castle, now the prefecture, the palace of justice, barracks, a covered market, a college, a museum, and a public library with 25,000 volumes. The old ramparts have been converted into public walks. In its vicinity are excellent baths, much frequented in summer. Its suburbs are large with many fine villas. It has considerable manufactures and distilleries; trade in grain, silk, cattle, etc. Chambéry was founded about the 10th century. It was under feudal lords till 1230, when it was ceded to Thomas, first Count of Savoy, who built the castle, where the princes of the house of Savoy resided till the government was removed to Turin. The town was surrendered to the French in 1792, and became the capital of the department of Mont Blanc. It was restored in 1815, and ceded to France again in 1860. Pop. (1900) 22,000.

Chambezi, chäm-bē'zī, a river of Africa, rising in the highlands south of Lake Tanganyika, about lat. 9° 40' S., and lon. 33° 15' E. Its tributaries are large, and form a considerable stream, which flows southwest to Lake Bangweolo.

Chambly, shän-blē, **Fort**, a fort situated near the rapids of the Richelieu or Chambly, at the outlet of Lake Champlain, during the time of the Revolutionary War. It was captured by the Colonists under Col. Bedel in 1775, and the colors of the Seventh Regiment of British regulars was sent to the Continental Congress as trophies of the victory.

Chambly River, a river of Canada, the same as the Richelieu or St. John.

Chambord, shän-bôr, **Henri Charles Ferdinand Marie Dieudonné**, dē-è-dôn-nā, COMTE DE, Duke of Bordeaux, French noble: b. Paris 29 Sept. 1820; d. Frohsdorf, Austria, 24 Aug. 1883. He was the last representative of the elder branch of the French Bourbon dynasty, and was called by his partisans Henry V. of France. He was born after the assassination of

CHAMBORD — CHAMELEON

his father, Prince Charles Ferdinand d'Artois, Duc de Berry. Charles X., after the revolutionary outbreak of 1830, abdicated in his favor; but the young count was compelled to leave the country with the royal title unrecognized by the nation. He lived successively in Scotland, Austria, Italy, and London, keeping a sort of court, and occasionally issuing manifestos. In 1846 he married the Princess Maria Theresa, eldest daughter of the Duke of Modena; and in 1851 inherited the domain of Frohsdorf, near Vienna, where for the most part he subsequently resided. While abstaining from violent attempts to seize the crown, he let slip no opportunity of urging his claims, especially after Sedan; but his belief in divine right, and his failure to recognize accomplished facts and modern tendencies, destroyed all chance of his succession.

Chambord, France, a castle, park, and village, near Blois, department of Loir-et-Cher. The splendid castle stands in the middle of a park, enclosed by walls extending eight leagues. It contains 440 rooms, 13 large staircases, and stalls for the reception of 1,200 horses. It was built in the Gothic style, by Primatice, for Francis I., and completed under Louis XIV. Here Francis I. indulged his inclination for gallantry; here the arts first sprang to life in France; and here King Stanislaus Leczinsky resided for nine years. In 1745 it was given by Louis XV. to Marshal Saxe, who died there in 1750. The Emperor Napoleon I. gave the domain of Chambord to Marshal Berthier, and in 1821 a company of Legitimists bought it and gave it to the Duke of Bordeaux, son of the Duke de Berry and grandson of Charles X.

Chambray, Georges, zhörzh shän-brä, MARQUIS DE, French general: b. Paris 1783; d. 1848. He served in the Napoleonic wars, fell into the power of the Russians, was banished to the Ukraine, and not permitted to return to France until after the fall of Napoleon. From 1823 to 1829, he filled high military positions at Vincennes and Perpignan. He wrote various works on military subjects. A second edition of his 'Philosophie de la guerre' appeared in 1835, and a 'Life of Vauban,' written by him, appeared in the 'Plutarque Français.' His most important production is his 'Histoire de l'expédition de Russie,' which appeared in 1837, and has since passed through several editions.

Chambre Ardente, shänbr är-dänt ("fiery chamber"), an apartment hung with black and lighted with tapers, in which the corpse of a person of distinction is deposited before the funeral ceremonies. The name was formerly given in France to an apartment, similarly draped and lighted, in which sentence of death, frequently by burning, was pronounced on heinous offenders. In a historical sense the term is more especially given to those extraordinary tribunals which, from the time of Francis I., directed the persecutions against heretics, and acted as a sort of inquisition. The members of the tribunal were named by the Pope. They ferreted out heretics, directed the proceedings against them, pronounced sentence, and also saw it carried into execution. A chambre ardente was established by Louis XIV. to put a stop to the numerous cases of poisoning which, after the proceedings against the Marchioness of Brinvilliers, were brought before the public. Many persons of the highest rank, among others the

Marshal of Luxemburg and Princess Louise of Savoy, were brought before this court, which, however, existed only for two years, and ceased in 1680. The last exercise of its powers was the condemnation of the celebrated sorceress, Voisin.

Chambre des Comptes, dā könt, a great court established in France prior to the Revolution, for various purposes; as for the registration of edicts, ordinances, letters patent, treaties of peace, etc. The sovereign Chambre des Comptes was held at Paris; there were also inferior courts in 10 provincial cities.

Chambre Introuvable, äñ-troo-vä-bl ("the chamber the like of which is not to be found again"), the term applied to the French Chamber of Deputies which met after the second return of Louis XVIII., and which by its fanatic loyalty threatened to again plunge France into anarchy and commotion.

Chameck, chä-mëk', a species of spider-monkey. See COATA; SPIDER-MONKEY.

Chameleon, ka-mël'yün or ka-më'lë-ön, lizard belonging to the family *Chamaeleontidæ*. The chameleons are generally considered as constituting a sub-order or equivalent primary division of the *Lacertilia* (q.v.). All parts of their anatomy present striking peculiarities. The parietal and squamosal bones are greatly produced and meet at a common apex, thus forming a bony tripod which supports the integument of a conspicuous crest or casque on the posterior part of the head. In many species the strangeness of the physiognomy is enhanced by warts, serrated crests, and prominent spines. Trifid teeth are situated on the ridge (acrodont) of the maxillary and dentary bones, but the premaxillary is toothless. The eyelids are almost completely united, leaving only a minute circular orifice through which the animal sees, and which moves with the eyeball in its almost constant roving. More remarkable still is the well-known fact that the two eyeballs move quite independently; one may be directed at an object behind while the other views one in front. The tongue is club-shaped at the free end and slips into a sheath at the base, from which it can be projected by a complex mechanism to a distance of more than half the total length of the animal, and returns, like a bit of rubber, with great rapidity to its former position. Quite unique among lizards is the prehensile tail, which rolls downward in a flat spiral and is utilized for clinging to twigs. Serving the same purpose in the arboreal life of the animal are the almost equally peculiar feet, which have five toes arranged in two opposed sets on both fore and hind feet, but in the former the first, second, and third toes form the inner and the fourth and fifth the outer group; while on the hind feet the first and second are internal, the remaining three in the opposed outer group. Among internal peculiarities may be mentioned the lungs, which are produced into a series of long tubular diverticula, which extend to all parts of the trunk, and by means of which the chameleon is enabled to swell up its body in the fashion of a toad when angry or threatened. But the chameleon is most famous for an attribute which is by no means confined to it, but is common to many lizards and other animals. The well-known facility with which

CHAMELEON — CHAMINADE

it changes its colors is referred to. This is accomplished at the will of the animal, or results from the direct influence of external stimuli, by a relatively simple mechanism. The outer portion of the skin or epidermis is transparent; beneath this is a layer of cells filled with granules and oil-drops which appear white or yellow; among and beneath these again are large irregular chromatophores or cells filled with black and red pigment granules. These chromatophores are under the control of the nervous system, and have the power, when appropriately stimulated, of sending out long branching processes filled with pigment into the spaces between and external to the light-colored cells. When this occurs the latter cells are concealed by a pigment curtain and the animal appears dark-colored; when, on the other hand, the chromatophore processes are withdrawn, and the pigment is concentrated in the deeper layers of the skin, the animal appears pale. The rapid play of colors is due to the interchange of these two conditions in varying degrees.

Upward of 50 species of chameleons are known, belonging to the typical genus *Chamaeleon*, and a few others. With the exception of a few species which inhabit Arabia and India, and one whose range extends across the Mediterranean into southern Spain, all are confined to Africa, and a very large number of the strangest forms to the island of Madagascar. The common chameleon (*C. vulgaris*) is the one which inhabits the shores of the Mediterranean, and, through being so well known to Europeans, has made the peculiarities of these lizards almost proverbial.

In the United States the name chameleon is commonly applied to a lizard (*Anolis principalis*) and its allies, belonging to a quite different group. The American chameleon belongs to a genus of the family *Iguanidæ* of numerous species which swarm in tropical America and the West Indies. It is probable that it has been popularly classed with its African namesake because of the equal facility with which changes of color are effected. It may be bright green, yellowish-gray, rich brown, or almost black, and the male is peculiar in having beneath the throat a pouch of elastic skin which can be inflated by means of a pair of delicate bony rods belonging to the skeleton of the tongue, when it appears of a flaming orange or vermilion color. They are dainty, smooth-bodied little animals, and are chiefly arboreal, jumping from twig to twig in pursuit of insects with an activity that contrasts strongly with the sluggishness of the European chameleon, which depends upon its projectile tongue to secure its game. *Anolis principalis* is the only member of the genus which enters the United States, and is quite common in Florida and other southern States, from which numbers were shipped to the north a few years ago to supply the requirements of a silly fashion in vogue at that time of wearing the pretty lizards secured to the dress by a tiny golden chain about its neck. Owing to the ignorance of the wearers, many of the chameleons quickly succumbed to thirst, as they, in common with most lizards, require a constant supply of water.

Chameleon, a southern constellation containing nine stars, lying within the Antarctic polar circle.

Chameleon Mineral, manganate of potassium, so called because a solution of it changes from green, through a succession of colors, to a rich purple.

Chamfort, shän-fôr, **Sébastien-Roch Nicolas**, French revolutionist: b. near Clermont in Auvergne 1741; d. 1794. He made his début as a litterateur under the name of Chamfort, and obtained some success as a dramatist and as a critic, which procured him a place in the French Academy, a pension, and a place at court. An independent and somewhat misanthropic spirit made him, however, in spite of his interest, favor the Revolution, of which he became the epigrammatist. He resigned his employment at court, and took the literary editorship of the 'Mercury.' He furnished Sièyes with the idea and the title of his famous pamphlet 'Qu'est-ce que le Tiers-É at?' and forged such popular watch-words as: Guerre aux châteaux, paix aux chaumières ("War to the castles, peace to the cottages"). He was employed by Roland in the 'National Library,' and published the first 26 'Tableaux Historiques de la Révolution.' Threatened with imprisonment, he endeavored to blow out his brains. Though not immediately fatal, the wounds he inflicted on himself ultimately put a period to his life. His poetry has now little reputation. His best work, 'Mustapha and Zeangir,' at which he labored for 15 years, exhibits him as a feeble follower of Racine and Voltaire. It is praised for purity of style and mildness of sentiment; but, as a French critic pungently observes, he reserved all his mildness for his tragedies. A collection of 1,800 *bon mots*, under the title 'Chamfortiana,' is now considered the best memorial of him. In this he appears as a man to make himself feared rather than loved.

Chamier, shä-mēr', **Frederick**, English novelist: b. London 1796; d. 1870. He entered the navy at an early age, took part in the last campaigns against the French, and distinguished himself in the American war of 1812. He retired in 1833 with the rank of captain, and living at Waltham Hill, acted as a justice of the peace for the counties of Hertford and Essex. He imitated Captain Marryat in making his experience of a sea life the basis of a series of romantic tales, but did not equal him in humor and imagination. He has, however, been credited with great fidelity to nature. His principal works are: 'The Life of a Sailor' (1834); 'Ben Brace' (1835); 'The Arethusa' (1836); 'Jack Adams' (1838); 'Tom Bowline' (1839). He also published a review of the scenes witnessed by him in the revolution of 1848.

Chaminade, shä-mē-näd, **Cecile Louise Stephanie**, French musician: b. Paris 8 Aug. 1861. She studied at Paris under Le Couppey, Savard, Marsick, and Benjamin Godard; soon acquired a high reputation as a pianist, and played at concerts in Paris, Berlin, Vienna, London, Constantinople, and other cities. Her compositions, which are widely known, include 'Callirhoë,' a ballet symphony performed with great success at Marseilles (1888), Lyons (1889), and Bordeaux (1901); 'Les Amazones'; 'Ménétriers'; and a number of songs, among which are 'Madrigal'; 'Chanson Slave';



CHAMELEON.

CHAMISSO — CHAMOUNI

‘Ritournelle’; ‘Fleur de Matin’; and ‘Sans Amour.’

Chamisso, shä-mēs'sō, **Adelbert de** (properly LOUIS CHARLES ADELAIDE DE CHAMISSO DE BONCOURT), German writer: b. at the castle of Boncourt, Champagne, 27 Jan. 1781; d. Berlin 21 Aug. 1838. When a boy his family were driven by the breaking out of the Revolution to seek an asylum in Berlin. On the Peace of Tilsit he returned with his family to France, and in 1810 was appointed professor in the Lyceum of Napoleonsville; but shortly after returned to Prussia, and during three years devoted himself enthusiastically to the study of natural science at Berlin. Count Romanzoff having in 1815 fitted out a vessel, under the command of Otto von Kotzebue, for the discovery of the northwest passage, Chamisso accepted the appointment of naturalist to the expedition, and added greatly to his store of scientific knowledge. He afterward took up his residence at Berlin, was appointed superintendent of the botanic garden, and received the diploma of doctor from the university for the collections in natural history which he had presented to the museum. His abilities as a naturalist are displayed in his work ‘*De Animalibus quibusdam e Classe Vermium Linnæi*’ (1819); and his ‘*View of the Most Useful and the Most Noxious Plants of North Germany, with Remarks on Scientific Botany.*’ In 1827, partly for the purpose of rebutting the charges brought against him by Kotzebue, he published ‘*Views and Remarks on a Voyage of Discovery,*’ and ‘*Description of a Voyage Round the World.*’ Both works display great accuracy and industry. His last scientific labor was a tract on the ‘*Language of Owyhee.*’ His reputation as a naturalist has been somewhat eclipsed by that which he acquired as a poet. As early as 1804-6 he, in concert with Varnhagen von Ense, published a collection of poems, under the name of the ‘*Muses' Almanac*’; and in 1813 appeared his celebrated and most original tale, ‘*Peter Schlemihl,*’ which has been translated, among other languages, into English, and admirably illustrated by Cruikshank. His poetry is marked by vigor, correctness, and a thorough command of the German language; but is in general of a gloomy and terrific cast. He is the author, however, of several humorous pieces; and his political poems are distinguished by caustic, yet wholesome raillery. Many of his ballads and songs are masterpieces of their kind. See Hitzig, ‘*Leben und Briefe von A. von Chamisso*’ (1839); Fulda, ‘*Chamisso und seine Zeit*’ (1881); Raymond, ‘*A. von Chamisso als Naturforscher*’ (1889).

Chamois, shäm-wä or shäm'ī, a horned animal (*Rupicapra tragus*) classed among the goat-antelopes, and native to the mountains of middle and southern Europe from the Pyrenees to the Caucasus and Georgian Mountains, and as far east as Persia. The chamois found in the Pyrenees and in the Caucasus differ in local peculiarities from the Tyrolese, which is the race-type. This is about the size of a goat; but its neck is somewhat longer in proportion than that of the goat and is more graceful. The general color is brown; the head pale, almost yellow, with a dark marking on each cheek; the nails black. The short black horns rise straight from the forehead, and are recurved at the tip.

The chamois may be found in summer, in the highest Alpine altitudes, close to, and indeed beyond, the snow-line. In winter it seeks the forests, where it is somewhat protected. These forests furnish also a covert for the females and fawns, and supply the aromatic herbs on which the chamois feed, sometimes in considerable herds, though in the Alps, where they have been much hunted, the herds are small. The breeding season is in May and June.

The chamois is famous for its agility. It crosses easily, and without hesitation, chasms 15 feet or more in width; leaps rock walls a dozen feet high as easily as a boy vaults a low fence, and roams through mountain passes which other quadrupeds would shun,—dashing, with sudden leap, down almost perpendicular walls, and alighting on incredibly narrow ledges, with its fore feet so close to its hind feet as almost to touch. The creature is timid; and when feeding in flocks, one is always on the watch to announce danger by a peculiar whistling noise.

Chamois-hunting as a sport is almost impossible in the Alps, as the numbers have been so reduced by continuous hunting that the remaining ones are protected by law—only a few being annually at the disposal of the hunter; but, in the Carpathians and eastward the sport is not restricted; and he who possesses the mountaineering and sportsman-like qualities necessary may there stalk his game alone, or with a native guide, through dangerous mountain defiles.

Chamois leather is valuable commercially for its softness and warmth (see LEATHER), and the flesh is esteemed a table delicacy. The horns are used for ornamental purposes, especially in making souvenirs of Alpine tourist resorts.

Cham'omile. See CAMOMILE.

Chamond, St. See ST. CHAMOND.

Chamore'ril, a lake with apparently no outlet, in Middle Tibet, on a plateau 15,000 feet above the sea, between the upper waters of the Sutlej and the Indus. It is surrounded by mountains some 5,000 feet in height, from which it receives much water. Its length of 15 miles and width of 2½ are pretty constant. On account of its great depth it freezes only in winter.

Chamouni, shä-moo-nē, or **Chamonix**, shä-mō-nē, a celebrated valley of France, in the department of Haute-Savoy, district Faucigny, in the Pennine Alps, fully 3,000 feet above sea-level. It is about 12 miles long, and only about half a mile wide; lies southwest to northeast, its east side formed by Mont Blanc and other lofty mountains of the same range, and its west side by Mont Brévent and the Aiguilles Rouges. It is traversed in its whole extent by the Arve, which leaves the valley by a narrow gorge at the southwest end, through which also passes, high above the river, the highway to Sallanches and Geneva. At its north end the valley communicates with Canton Valais by two roads and a bridle-path, the latter crossing the Col de Balme; and it may also be left by other passes, as the Col du Géant, but they are difficult and dangerous, and only suited for practised and daring pedestrians. The mountains on the west side of the valley, though attaining a height of 8,500 feet above sea-level, are not covered with snow in summer; but those on the east side, in the

CHAMP CLOS — CHAMPAGNE

range of Mont Blanc, being from 10,000 to upward of 15,000 feet high, are always snow-clad, excepting where the peaks are too perpendicular for snow to lie. From the snowy range proceed the glaciers, some of which approach close to the cultivated fields. They are very numerous, and of different sizes; but the two most important are the Glacier des Bossons and the Mer de Glace, the latter one of the largest glaciers in the Alps. From its lower extremity, called the Glacier des Bois, the meltings of the glacier flow off, in greater or less volume according to the season of the year, from under a naturally formed ice-arch, the source of the Arveyron, the name given to the stream thus formed, which is an affluent of the Arve. The lower slopes of the mountains are covered with timber, through which is frequently to be seen the devastating course taken by the avalanche. The soil is not fertile, but it is assiduously cultivated; and the inhabitants, who are gathered together in numerous vilages, of which Chamouni or Le Prieuré is the chief, raise barley, oats, spelt, flax, potatoes, etc., raise cattle, and keep bees. During the winter, yarns, cloths, hats, and implements are made, and many articles of wood are carved. All the valley is famous for its scenery, which was first brought to public notice by Windham and Pococke, two Englishmen who visited it in 1741. It presents various points from which the whole mass of Mont Blanc may be seen at one view. The village of Chamouni, 39 miles east-southeast of Geneva, originated in a Benedictine priory founded about 1090. It has several hotels, and is supported mainly by visitors to the scenery of the valley. The ascent of Mont Blanc is most commonly made from this village. There is a monument to De Saussure, who did much to bring the valley before the notice of travelers. Pop. 2,435.

Champ clos shän klō (Fr. "a closed-in field or area"), formerly a place set apart for duels between those who wished to determine, in that manner, either a lawsuit or dispute of honor. This name was also given to the place set apart for tournaments.

Champ - de - Mars, shän - de - märs, and **Champ-de-Mai**, de mā, the annual public assembly of the Franks. They were held originally in March and called from the place of meeting Champs-de-Mars; in the 8th century they were transferred by Pepin, the father of Charlemagne, to the month of May, and called the Champs-de-Mai. At the Champs-de-Mai, all questions relating to public affairs, such as war, peace, the enactment of laws, were decided by the majority. These assemblies were held irregularly under the Merovingians, but became more frequent and systematic under the first Carolingians. Pepin called together only the nobility and the clergy; but Charlemagne ordered that every count should bring with him 13 men from his jurisdiction, to represent the people in the General Assembly. The first descendants of Capet departed from this usage; but Philip IV., who reigned from 1285 to 1314, restored the third estate by calling together delegates from the cities.

The modern Champ-de-Mars in Paris is an extensive area, on the left bank of the Seine, which originally formed a place of exercise for the young men in the military school, and subsequently has been the scene of various public

festivals and great gatherings of people. Louis XVI. and his family took part here, in 1790, in the great Fête de la Fédération, in which the king swore to defend the new constitution; in June 1794, it was the scene of the Fête de L'Être Suprême. In 1815 Napoleon selected the Champ-de-Mars for the scene of a general assembly of the French people, at which he placed before the representatives of the nation the articles of a supplementary constitution, called the *Acte additionnel*, intended to establish the legality of his throne. It has also been the site of international expositions of 1867, 1878, 1889, and 1900. See PARIS.

Champac. See CHAMPAK.

Champagne, shän-pän-yü, or **Champaigne**, **Philippe de**, Flemish painter: b. Brussels 26 May 1602; d. Paris 12 Aug. 1674. He went to Paris at the age of 19, and worked on the decorations of the Luxembourg under Duchesne; he was later appointed court painter by Marie de Medicis. He was also a member and finally rector of the Academy of Painting and Sculpture. His coloring is excellent and his portraits possess great merit. His best pictures are at Vincennes and at Paris; among them are a portrait of himself, a portrait of Richelieu, 'The Apostle Philip,' and 'The Last Supper,' all in the Louvre.

Champagne, France, an ancient province which before the Revolution formed one of the 12 great military governments of the kingdom. The name Champagne, formerly Champaigne, is derived from the vast plains (Lat. *campus*, "a plain") which occupy the territory. Champagne was bounded on the north by Hainaut and the bishopric of Liége; on the east by the duchy of Luxembourg and Lorraine; on the south by Franche-Comté and Burgundy; and on the west by L'Orléanais, L'Isle de France, and Picardie. It forms at present the departments of the Marne, Haute Marne, Aube, Ardennes, and part of those of the Yonne, the Aisne, Seine-et-Marne, and Meuse. The land is fertile, and produces the celebrated wine called after its name. In the Middle Ages it was a countship of which Troyes was the capital, and was incorporated with France in 1361.

Champagne, shäm-pän'; (Fr. shön-pä-nyë), a French wine made chiefly in the department of the Marne, in the former province of Champagne. It is commonly divided into river and mountain wines (*vins de la rivière de Marne*, and *vins de la montagne de Rheims*), the former being for the most part white, the latter red. Not all of these wines are sparkling or frothing, though by the name "champagne" is generally understood such wine as has been subjected to an imperfect fermentation, and contains a quantity of carbonic acid gas, generated during the insensible fermentation in the bottle, this gas being disengaged on removing the pressure by which it was detained in solution. The briskest wines are not always the best; they are, of course, the most defective in true vinous quality, and the small portion of alcohol which they contain immediately escapes from the froth as it rises on the surface, carrying with it the aroma, and leaving the liquor that remains in the glass nearly vapid. Hence the still or the creaming or slightly sparkling Champagne wines (*vins crémants* or *demi-mousseux*) are more highly valued by connoisseurs and bring greater

CHAMPAGNY — CHAMPFLEURY

prices than the full-frothing wines (*vins grand-mousseux*). By icing these wines before they are used the tendency to effervesce is in some degree repressed; but when they are kept cool this precaution is unnecessary. In general, it may be observed that the vineyards on the banks of the Marne supply the choicest wines, and that the quality degenerates in proportion as they recede from the river. Among the white wines of Champagne the first rank is generally assigned to those of Sillery, the produce of the vineyards of Verzenay, Mailli, Raumont, etc. Of the Rheims Mountain wines those of Verzi, Verzenay, Mailli, Bouzy, and St. Basle are most esteemed; but the Clos St. Thierry furnishes perhaps the finest red champagne. The soil of the principal vineyards throughout Champagne is composed of a loose marl resting on chalk and sometimes mixed with flints. For the manufacture of the white Champagne wines black grapes are now generally used. In making the red wines the grapes are trodden before they are introduced into the vat. Champagne, when well made, and placed in cool cellars, will retain its good qualities from 10 to 20 years.

Champagny, shān-pān-yē, **Jean Baptiste Nompere** (nōn-pār) **de**, (DUKE OF CADORE), French naval officer, diplomatist and politician: b. Roanne 4 Aug. 1756; d. Paris 3 July 1834. He entered the navy in 1780, and was a member of the States-General, National, and Constituent Assemblies. Thrown into prison in 1793, he was released after the 9th Thermidor (1794), and became councilor of state. He was employed by Napoleon as ambassador to Vienna, and as minister of the interior and of foreign affairs, and he negotiated the marriage with Marie Louise. After Napoleon's downfall he transferred his allegiance to the Bourbons, under whom he became a peer.

Champaign, shām-pān', Ill., a city in Champaign County, on the Illinois Cent., the Cleveland, C., C. & St. L., and other R.R.'s, 48 miles southeast of Bloomington. It is the trade centre of the richest agricultural county in the State, and has also a number of manufacturing interests. It is the seat of the University of Illinois, and of the Burnham Athenæum and Hospital. Pop. (1900) 9,098.

Cham'pak, chūm'pāk, an East Indian tree (*Michelia champaca*), of the natural order *Magnoliaceæ*. It has large axillary flowers of a deep yellow color, and very fragrant, which are much celebrated in Hindu poetry. The tree is sacred to Krishna, and the women of India adorn their hair with its blossoms. The bark has tonic properties.

Champaran, chūm-pā-rūn', India, a district in the province of Behar, in the northwestern part of Bengal, south of Nepal, and east of Oudh; area, 3,531 square miles. The surface is mostly a fertile plain which produces rice, grains, sugar, opium, indigo, etc. Gold is washed down by the rivers from the mountains of Nepal. The climate is very unhealthy. Pop. 1,500,000.

Champe, chāmp, **John**, American soldier: b. Loudon County, Va., 1752; d. Kentucky about 1790. He was selected by request of Washington to go to New York as a deserter and spy, and if possible to seize and bring off Arnold in time to save the life of André. Champe under-

took the enterprise with courage, passed the American lines with difficulty, was hotly pursued by his comrades as a deserter, reached New York, underwent an examination before Sir Henry Clinton, and by him was consigned to Gen. Arnold, who gave him in the British army his former rank. He discovered the custom of Arnold to walk in his garden at a late hour every night, formed a plan with a comrade to seize and gag him there, and to take him between them as a drunken companion to a boat on the Hudson, whence arrangements were made for his transportation to the American headquarters. On the appointed night Arnold failed to appear in the garden, and Champe, after waiting for him till near morning, returned with deep chagrin to his position in the British army. It proved that Arnold had the day before changed his quarters, preparatory to the embarkation of his troops for Virginia. There was nothing left for Champe but to embrace the first opportunity to escape to the American army, which he did soon after landing in Virginia, and joined the troops under Gen. Greene. Washington discharged him from further service, lest, falling into the hands of the enemy, he should be immediately put to death upon a gibbet. When subsequently Washington sought for him to reward him for his faithful and dangerous service, he learned of his recent death.

Champeaux, Guillaume de, gē-yōm de shān-pō, French philosopher: b. Champeaux in Brie, about 1050; d. 1121. He was so called from the place of his birth. He studied at Paris under Anselme, De Laon, and Manégoide, and afterward himself opened a school there, in which he had numerous pupils. The schools opened by De Laon and Champeaux are regarded by Pasquier as the origin of the University of Paris. Among the pupils of Champeaux were Robert de Bethune, one of the most distinguished prelates of the age, and still more famous Abelard. He defended the doctrine of realism against the nominalism of Abelard; but it is only in the works of Abelard that any record of their contention remains. Champeaux has left a treatise on the origin of the soul, 'De Origine Animæ,' in which he examines the question how children dying without baptism are justly damned, which he concludes by referring to the unfathomable judgments of God. The only other work of his which has been printed is 'Moralia Abbreviata.' He founded in 1113 the abbey of St. Victor.

Cham'perty, or **Cham'party** (Lat. *campi partitio*, "a division of lands"), in law, a bargain with the plaintiff or defendant in any suit to have part of the land, debt, or other thing sued for, if the party that undertakes the suit prevails therein, the champertor carrying on the party's suit at his own expense. It is a species of maintenance, and is generally held to be illegal both in courts of common law and equity; but in some of the States of this country such agreements are recognized by law, and the tendency is toward freedom of action in these as well as other contracts. See MAINTENANCE.

Champfleury, shān-flè-rē, pseudonym of JULES FLEURY-HUSSON, French novelist and miscellaneous writer: b. Laon 10 Sept. 1821; d. Sèvres 5 Dec. 1889. His story of 'Les Chien-Cailous' was in Victor Hugo's opinion a masterpiece of realistic description. He wrote an

CHAMPIER — CHAMPION'S HILL

autobiographical novel of his youthful years in 'The Confessions of Sylvius' (1849), continuing the story in 'The Adventures of Mariette' (1856). But his 'Burghers of Molinchart' (1855), a satiric delineation of the provincial bourgeoisie, made him famous. He is a pronounced "realist." Among his later novels 'The Tourangeau Girls' (1864), and 'The Little Rose,' are most worthy of mention. He compiled a 'General History of Caricature' (5 vols. 1865-85), with a supplementary volume, 'Secret Museum of Caricature' (1888); and several other works on the arts of design and ceramics.

Champlier, shän-pē-ā, **Symphorien**, French historian: b. St. Symphorien-le-Loise, Lyonnais; d. Lyons about 1540. Famed as a physician, with powerful friends at court and an ample fortune, he took delight in literature and the society of literary men, himself writing a series of poems for 'Virtuous Ladies' (1503), in four divisions, entitled 'The Flower of Dames,' 'The Rule of Love,' 'The Prophecies of the Sibyls,' and 'The Book of True Love,' respectively. His best history is an account of 'Princes and Battles' (1502).

Champignon, shän-pē-ñon, the French name for the common mushroom (*Agaricus campestris*). See **AGARIC**.

Champion, chäm'pī-ōn, one who undertakes to defend, in combat or by argument, another person, a doctrine, or a cause. In the rudest state of society men avenge their own wrongs without restraint. The first step commonly made toward a better state of things in the rude beginnings of political society is to confine this right within certain bounds, and allow it to be exercised only with certain formalities. This was done by the feudal institutions of Europe, which recognized in many circumstances, under the toleration of the Church itself, the right of private combat. In some countries, however, particularly in England, the legal recognition of the right of combat had this injurious effect, that the practice became so settled as to be allowed to continue even after more rational ideas had grown up on the subject of the administration of justice. The combat, after it had become a common means of settling disputes, was not always waged by the contending parties. This was the case, indeed, in appeals of felony, and if the heir, either from sex or age, was incapable of "waging his battle," as it was called, the question was left to a more rational mode of settlement. But in the writ of right, the last and most solemn decision respecting real property, the tenant was required to produce his champion, who threw down his glove as a challenge to the champion of the demandant, and the latter, by taking it up, accepted the challenge. The laws authorizing judicial combat, though fallen into disuse, continued to disgrace the English statute-book till 1819. Even the right to the English crown was in some degree put in issue by appeal to judicial combat; and the appearance of a champion offering battle to any one who gainsays the right of the king to the crown was till recently a part of the ceremonial of an English coronation. This office was for four centuries hereditary in the family of Dymoke, of Lincolnshire. The champion's function was to ride into Westminster Hall in full knightly armor, throw down his gauntlet, and proclaim his readiness to de-

fend the title of the sovereign to the crown against any one disputing it. The last exercise of the office was at the coronation of George IV.

The term "champion" is also used in the realm of athletics to designate one who is pre-eminent in a certain branch. More especially is it applied to the foremost boxer, wrestler, or billiard-player, or in the case of the first two sports, to the leader in his class as distinguished by weights, etc. See **BOXING**. Those pre-eminent in track athletics are usually said to "hold the record."

Champion's Hill, Battle of. On 30 April 1864, Gen. Grant crossed to the east side of the Mississippi River at Bruinsburg, 32 miles in a direct line below Vicksburg. On 1 May he marched to Port Gibson, defeating a Confederate force under Gen. J. S. Bowen. This turned the position at Grand Gulf, and on the 3d Grant reached Hankinson's Ferry; then, after bringing up supplies, marched northeast to interpose between the Confederates, under Gen. J. C. Pemberton, in and near Vicksburg, and those at Jackson, the capital of Mississippi, 40 miles east of Vicksburg. The battle of Raymond was fought and won on the 12th, and on the 14th Gen. Joseph E. Johnston was attacked, defeated, and driven north from Jackson, Grant occupy-



ing the place. Learning from an intercepted dispatch, one of three sent by Johnston to Pemberton, on the 13th, that Pemberton had been advised to march with all his available force on Clinton, 10 miles west of Jackson, and attack Grant's rear, while Johnston operated on his front or flank, Grant, leaving Sherman with two divisions at Jackson to destroy all public property and manufacturing establishments, turned the rest of his army from Clinton, Raymond, and Auburn, on Bolton and Edwards' Station, on the Vicksburg & Jackson R.R., the nearest points where Johnston could unite forces with Pemberton, and at night of the 15th the various divisions were near their designated positions. Pemberton, with the three divisions of C. L. Stevenson, J. S. Bowen, and W. W. Loring, was near Big Black River, on the 14th when he received one of the triplicate dispatches sent by Johnston on the 13th. Anxious to hold Vicksburg and the line of the Big Black, 13 miles east, he questioned the wisdom of acting upon Johnston's suggestion, and called a council of his leading officers, a majority of whom agreed with Johnston; but he adopted the suggestion of Loring and Stevenson, to move on Grant's rear in the direction of Raymond, and advanced on the 15th for that purpose, Loring's division halting at night on the Raymond road at Elliston's, eight miles east of Edwards' Station, the other divisions farther north on roads coming

CHAMPLAIN

into the Raymond road. Early next morning the march was resumed, but the head of column had scarcely left camp when Pemberton received a despatch from Johnston that he had been driven north from Jackson, and advising that he move directly on Clinton, and inform him of the movement, that he also might move to that point with 6,000 men. Pemberton concluded to make the movement. He immediately turned back his trains to Edwards' Station to get the road leading to Brownsville on the north, and had scarcely done so, when Osterhaus' and Smith's divisions of Grant's army made their appearance on the Raymond road and attacked his skirmishers, upon which he suspended his movement to join Johnston. Continuing the reversal of his trains to the rear, he formed for battle on the general line of a cross-road, connecting the Raymond and Clinton roads, Loring on the right, covering the Raymond road, Bowen in the centre, and Stevenson on the left, on the northern point of a narrow ridge, known as Champion's Hill, about 60 to 70 feet above the general level of the country, covering the Clinton road and the intersection of the cross-road. Stevenson formed line while heavy skirmishing was going on to his right. Pemberton had about 17,500 men. The position of Grant's army on the night of the 15th was as follows: Hovey's division was at Bolton on the Clinton road; Logan's and Crocker's were on the same road a few miles in Hovey's rear; Osterhaus' was on a cross-road half-way from Raymond to Bolton; Carr's a short distance in his rear; and the divisions of A. J. Smith and Blair were west of Raymond on the Edwards' Station road. These seven divisions numbered about 32,000 men, on the three roads converging on Edwards' Station, and known as the Raymond road on the south, the middle road, and the Clinton road on the north. Early on the morning of the 16th Grant, who was at Clinton, heard that Pemberton was marching to attack him, upon which he sent orders for McPherson, with the divisions of Logan and Crocker, to close up rapidly on Hovey, and for the four divisions under McClernand on the Raymond and middle roads to move forward cautiously and establish communications with each other. He then hastened by the Clinton road to the front. A. J. Smith, advancing on the Raymond road, attacked and drove in Loring's skirmishers about 8 o'clock, and Osterhaus on the middle road engaged those in his front, artillery was brought up and opened fire, but McClernand, who was in command of the four divisions, more than half the army on this part of the field, doubtful if Grant wanted him to bring on a general engagement, deferred attack until 2 P.M., when he received Grant's order to attack, upon which he ordered Smith and Osterhaus to attack vigorously and "press for victory," but the attack was not a vigorous one, and meanwhile the battle was being fought out and decided on the right, on Champion's Hill. Hovey, advancing on the Clinton road began skirmishing with Stevenson about 10 o'clock, and began to form line for a general attack, but was directed by Grant to wait until McClernand could be heard from. Logan came up at 11 o'clock; nothing had been heard from McClernand, and line was formed for a general attack, Hovey south of the Clinton road and Logan on his right. It was about noon when

Hovey advanced with great spirit, climbed Champion's Hill, and attacked; finally, after a hard contest with varying success, driving back the right of Stevenson and capturing 11 guns, soon after which Logan, who had worked around on Stevenson's left, on the north side of the hill, attacked and drove back Stevenson's left and captured seven guns. The positions thus gained were held until 2 o'clock. Meanwhile Stevenson, who had been compelled to take ground to the left to meet Logan's flank movement and cover the road to Baker's Creek and Edwards' Station, had induced Pemberton to draw Bowen to the left and close the interval between the two divisions, and Loring was ordered to close in on Bowen. It was after 2 o'clock when Bowen closed in on Stevenson, and his two leading brigades, F. M. Cockrell's and Green's, attacked Hovey furiously and drove him back down the hill, Hovey contesting every foot, but forced to abandon nine of the captured guns. As Hovey fell back two brigades of Crocker's division came to his support, and the Confederates were checked. Artillery was now massed, and poured such an effective enfilading fire upon Stevenson's line that it was much shaken, and Hovey and Crocker again charged up the hill, driving Stevenson and Bowen, after a desperate resistance, before them; and Pemberton, seeing his left entirely broken, at 3 o'clock gave the order for a general retreat, which he ordered Loring to cover. Before this, Loring, leaving Gen. Lloyd Tilghman's brigade on the Raymond road to oppose Smith and Blair, had already with two brigades nearly closed up on Bowen, and when the retreat began was forming his men between the Clinton and Raymond roads, when he was attacked by Osterhaus, and soon gave way, falling back to the Raymond road. Meanwhile A. J. Smith had advanced on the Raymond road, defeated and killed Tilghman. Loring reunited his command and retreated on the Raymond road, but when he came to the ford of Baker's Creek he found it in Union possession, upon which, after vain effort to find a crossing lower down, and realizing that he had been cut off from Pemberton's army, he moved off to the south, abandoning his artillery, and on the 19th joined Johnston, who meanwhile had re-occupied Jackson. Stevenson's and Bowen's men retreated to the Big Black, Grant following as far as Edwards' Station, where darkness ended the pursuit. Grant says he fought the battle with about 15,000 men actually engaged, in four hours of hard fighting, preceded by two or three hours of skirmishes, some of which rose almost to the dignity of battle. The Union loss was 410 killed, 1,844 wounded, and 187 missing. The Confederate loss was 380 killed, 1,018 wounded, 2,441 missing, and 24 guns taken. Grant pursued next day, the 17th, defeated Pemberton at the Big Black, and on the 19th invested Vicksburg. Consult: 'Official Records' (Vol. XXIV:); Greene, 'The Mississippi'; Grant, 'Personal Memoirs'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. III).

E. A. CARMAN.

Champlain, shän-plän or shäm-plän', **Samuel de**, French navigator, colonizer, and soldier: b. Brouage, Saintonge, about 1570; d. Quebec 25 Dec. 1635. In early life he served in the army of Henri IV., as quartermaster of

CHAMPLAIN — CHAMPNEYS

cavalry, but in January 1599 he sailed to the West Indies, Mexico, and Panama. On his return (1601) he prepared a record of this cruise, with charts, etc. In March 1603 he sailed for North America, and explored, by boat, the St. Lawrence River up to the Falls of St. Louis, and down to Gaspé. In May 1604 he sailed with De Monts along the shores of Nova Scotia, wintered on the island of St. Croix, and founded a colony at Port Royal. From 1604 to 1606 he made careful surveys and charts of the coast as far as Cape Cod. He revisited France in 1607, but sailed again in 1608, and founded Quebec, which, owing to the development of its fur-trade, rapidly increased in size. In 1609 he accompanied an Algonquin and Huron expedition against the Iroquois, and thereby discovered Lake Champlain, on the borders of which the Iroquois were defeated. From September 1609 to March 1610 he was engaged in bringing over French mechanics for his colony. He became lieutenant-governor of New France, 8 Oct. 1612; fortified Quebec in 1620; but was compelled in 1629 to surrender to an English fleet, and was taken to England. Released in 1632, he sailed again for New France, with three well-equipped vessels, and spent his last years in the government and development of the French colonies. He published 'Voyages à la Nouvelle France' in 1632.

Champlain, shăm-plān', **Lake**, a body of water chiefly in the United States, between the states of New York and Vermont, but having the north end of it within the Canadian boundary, in the province of Quebec. Its extreme length, north to south, is about 125 miles; breadth, from half a mile to 15 miles; area, about 600 square miles. It is 90 feet above the level of the sea. It was discovered in 1609 by Samuel Champlain, governor of Canada, whence its name. It is navigated by steamboats and other vessels, and is deep enough for ships of the largest class. Its waters are carried northward to the St. Lawrence by the river Richelieu or Sorel, which, in conjunction with the Chambly Canal, affords navigation for large vessels, and forms a well-frequented line of communication. The south end of the lake is connected by a canal with the Hudson River, Lake Champlain thus affording water communication between the St. Lawrence a few miles below Montreal and the Atlantic at New York. Upwards of 50 islands are scattered over its surface; and it receives numerous streams, none of which are very important. The scenery along its sides is picturesque. It abounds in salmon, shad, pike, and other fish; in winter it is usually frozen over. The chief port on its banks is Burlington, Vt. During the wars between the United States and Great Britain, this body of water was the scene of numerous military operations. On 13 Oct. 1776, Benedict Arnold engaged a vastly superior English force, and made a daring escape. On 11 Sept. 1814, the American Commodore McDonough gained, under adverse circumstances, a most brilliant and thorough victory over the English fleet, near Plattsburg. This was one of the earliest substantial successes for the United States in the War of 1812.

Champlain Summer School. See SUMMER SCHOOL.

Champlain Stage, the name given by American geologists to the subsidence that was a feature of the close of the Glacial Epoch in New York, New England, Ontario, and Quebec. At the beginning of the Glacial Epoch the elevation of this section of the continent may have been greater than now, but when the ice-sheet finally retreated the sea extended up the St. Lawrence River nearly to Lake Ontario, and the lower Ottawa River and Lake Champlain were occupied by salt water. The stage is named from the lines of old sea beaches containing whale and walrus bones, thus showing the submergence, typically developed about Lake Champlain. The total amount of the depression varied, being greatest over the St. Lawrence valley. About New York harbor the coast was depressed fully 70 feet; at Albany 355 feet. Along the Maine shore the land was 150 to nearly 300 feet lower than now, and in the St. Lawrence valley the depression was over 500 feet, making allowance for the previous elevation the total depression in the St. Lawrence valley reached 1,500 feet. The climate of Champlain time was probably warmer and moister than that of the present. On the Pacific coast are evidences of depression in the region about Mount St. Elias, shells of Champlain species being found at an altitude of 5,000 feet. See GLACIAL PERIOD; QUATERNARY PERIOD.

Champlin, chämp'līn, **James Tift**, American educator: b. Colchester, Conn., 9 June 1811; d. Portland, Maine, 15 March 1882. He graduated valedictorian at Brown University in 1834, and was tutor there, 1835-8. He was a Baptist pastor at Portland, Maine, 1838-41; professor of Greek and Latin, Waterville (now Colby) College, 1841-58; president of the college, 1857-73; professor of intellectual and moral philosophy, 1858-73, when he removed to Portland to devote himself entirely to literary work. He published a large number of school and college text-books, including English, Greek, and Latin grammars, editions of Æschines' and Demosthenes' orations, Tacitus, and Butler's 'Analogy of Religion.' Others are: 'Text-book of Intellectual Philosophy' (1860); 'First Principles of Ethics' (1862); 'Political Economy' (1868); 'Scripture Reading Lessons' (1876); 'Constitution of the United States; with Brief Comments on the Constitutions of England and France' (1880).

Champlin, John Denison, American author: b. Stonington, Conn., 29 Jan. 1834. He was graduated at Yale in 1856, and admitted to the bar in 1859. In 1864 he became associate editor of the 'Standard,' at Bridgeport, Conn. He afterward published 'The Sentinel' (1865-9) at Litchfield, Conn., and became associate editor of the 'American Encyclopædia' (1875). He is author of 'Young Folks' Cyclopædia of Common Things' (1879); 'Young Folks' Cyclopædia of Persons and Places' (1880); 'Young Folks' Catechism of Common Things' (1880); 'Young Folks' Astronomy' (1881); 'Young Folks' History of the War for the Union' (1881); 'Chronicle of the Coach' (1886); 'Young Folks' Cyclopædia of Games and Sports' with A. E. Bostwick (1890); 'Young Folks' Cyclopædia of Literature and Art' (1901).

Champneys, chämp'nīz, **Basil**, English architect: b. 1842. He was educated at Trinity College, Cambridge, and after studying archi-

CHAMPNEY — CHANCE

ecture with the architect Prichard, of Llandaff, began the practice of his profession in 1867. Important works of his are the divinity and literary schools of Newnham College, and the Archæological Museum at Cambridge; Indian Institute, Robinson Tower at New College, and Mansfield College at Oxford; Rylands Library in Manchester; Butler Museum at Harrow; and Quincentenary buildings at Winchester College. He is cathedral architect at Manchester. He has published 'A Quiet Corner of England,' a delightful description of Rye and Winchelsea (1875); 'Henry Merritt: Art Criticism and Romance' (1879); 'Coventry Patmore: Memoirs and Correspondence' (1900).

Champney, chămp'nī, Benjamin, American artist: b. New Ipswich, N. H., 20 Nov. 1817. He went to Boston in 1834, and for three years worked in a lithographic establishment. From 1841 to 1848 he studied painting in Paris and Italy, exhibiting several times in the Paris Salon. He works chiefly in landscape and flower painting, and his White Mountain paintings, which are owned in and around Boston, are famous. Since 1853 he has passed most of his summers at his cottage and studio in North Conway, N. H.

Champney, Elizabeth (WILLIAMS), American writer for young people: b. Springfield, Ohio, 6 Feb. 1850. She was married to J. W. Champney (q.v.), 15 May 1875. Many of her books are illustrated by her husband. Among them are the Vassar Girls' Series, 'Three Vassar Girls Abroad,' 'In England,' 'In South America,' etc.; 'In the Sky-Garden'; 'All Around a Palette'; 'Rosemary and Rue'; 'The Bubbling Teapot'; 'Bourbon Lilies'; 'Sebia's Tangled Web'; 'Romance of the Feudal Chateaux'; 'Fables in Astronomy'; 'Six Boys'; 'Dames and Daughters' Series.'

Champney, James Wells, American artist: b. Boston, Mass., 16 July 1843; d. New York 1 May 1903. He studied in Europe under Edouard Frere, and in 1882 became a member of the National Academy. He excelled in genre pictures and portraits, and exhibited oil paintings at the Columbian World's Fair (1893), and at the Paris (1900) Exposition.

Champollion, Jean François, zhōn fränswä shän pōl yōn, LE JEUNE, French Egyptologist: b. Figeac, Lot, France, 23 Dec. 1790; d. Paris 4 March 1832. At an early age he devoted himself to the study of Hebrew, Arabic, Coptic, etc. In 1807 he read a paper before the Academy of Grenoble on the ancient Egyptian geographical names, which he endeavored to explain by the Coptic. He then went to Paris, where he continued his Oriental studies, paying particular attention to the Coptic, and endeavoring through it to find the key to the Egyptian hieroglyphics. In 1809 he became professor of history at Grenoble, but soon retired from this post and went to Paris, where he devoted himself almost exclusively to the study of Egyptian antiquities. Assisted by the trilingual inscription of the Rosetta stone he at length discovered the key to the graphic system of the Egyptians, the three elements of which — figurative, ideographic, and alphabetic — he expounded before the Institute in a series of memoirs in 1823. These were published in 1824 at the expense of the state, under the title of 'Précis du Système hiéroglyphique des anciens Égyptiens.' In 1824

he went to Italy, and investigated the collections of papyri and other Egyptian antiquities in the principal cities there. In 1826 Charles X. appointed him to superintend the new department of Egyptian antiquities in the museum of the Louvre. In 1828 M. Champollion went as director of a scientific expedition to Egypt, at the expense of the king. He was admitted a member of the Academy of Inscriptions in 1830. In 1831 the chair of Egyptian archæology was created for him in the Collège de France. His principal works are: 'Grammaire Égyptien,' and 'Dictionnaire hiéroglyphique,' both published after his death. They are indispensable to the student of hieroglyphics.

Champollion-Figeac, fē-zhāk, Jacques Joseph, French archæologist, elder brother of the preceding: b. Figeac, Lot, 5 Oct. 1778; d. 9 May 1867. He completed his studies at Grenoble, published his first archæological memoirs in 1803, and was named successively librarian of Grenoble, professor of Greek literature, secretary and dean of the Faculty of Letters of the same town. He took an active part in everything connected with science and letters in the department of the Isère. He acted as secretary to Napoleon in drawing up under his instruction the account of his memorable passage from Elba to Grenoble. In 1828 a place was made for him as keeper of the manuscripts in the Royal Library, and shortly afterward he was installed in the chair of paleography in the École des Chartes. He was made an officer of the Legion of Honor in 1866. His principal works are: 'Antiquités de Grenoble' (1807); 'Paléographie Universelle'; 'Annales des Lagides' (1819); 'Traite élémentaire d'Archéologie' (1843); 'Écriture démotique Égyptienne' (1843); 'L'Égypte Ancienne' (1850); besides several other interesting works on Oriental history, and on the language and antiquities of the department of the Isère.

Champs-Elysees, shänz-ā-lē-zā (Fr. "Elysian Fields"), an avenue in Paris, with its surrounding gardens. It extends from the Place de la Concorde to the Place de l'Étoile, a distance of one and a quarter miles, and is a famous public resort and promenade. It became the property of the crown in 1616 and was ceded to the city in 1828.

Chanca, chän'ka, Dr. (believed to have been DIEGO ALVAREZ CHANCA), Spanish physician: b. Seville; who became a companion of Columbus on his second voyage in 1493. One of the principal authorities for this voyage is the letter which he wrote to the Catholic college at Seville, giving an account of his journey. No record has been kept of his subsequent life.

Chance, SIR William, English writer on sociology: b. 1853. He was educated at Harrow and Trinity College, Cambridge, and has been honorary secretary of the Central Poor Law Conference since 1893. He has published 'The Housing of the Working Classes of London' (1895); 'Children Under the Poor Law' (1897); 'Our Treatment of the Poor' (1899).

Chance, in its original and strict meaning, may be defined as that which determines the course of events in the absence of law, ordinary causation, or Providence. Strictly speaking, it is an idea which few men would now be disposed to admit as corresponding to anything

CHANCE ACQUAINTANCE — CHANCELLOR

which really exists; the religious mind excluding it as inconsistent with the belief in the divine government, and the philosophical mind rejecting it as inconsistent with a recognition of universal laws of causation. As a word, however, it has always been, and always will be popularly accepted as a term denoting an unknown cause, or a cause so remote that it is overlooked when events are considered superficially and apart from their universal connection.

Chance Acquaintance, A, a story by William Dean Howells, published in 1873. This agreeable and entertaining sketch contains many charming descriptions of the picturesque scenery and places about Quebec.

Chance, Games of. See GAMBLING.

Chance'-Medley, homicide happening either in self-defense, on a sudden quarrel, or in the commission of an unlawful act without any deliberate intention of doing mischief.

Chancel, that portion of a church occupied by the clergy, and often separated from the nave and aisles by screens of carved stone or oak. The screen separating the chancel from the nave is called the rood screen, because anciently a rood or large crucifix was usually placed on it, accompanied with two figures representing Saint John and the Virgin Mary. In the chancel were situated the high altar, the sedilia, or seats for the officiating clergy, and the piscina, in which the water used for washing the hands of the celebrant was poured. It usually contains carved seats or stalls, occupied by the clergy not engaged in the services. These are usually enriched with carvings, and have canopies of carved oak. The chancel occupies the same place with the apsis in the ancient basilicas, and was called so from the *cancelli* or rails used in the early churches to separate the clergy from the laity. The chancel is always at the east end of the church (churches being technically considered as having their major axes extending east and west), and is often constructionally a separate building opening from the nave with a lower roof elevation and raised several steps above the nave. In architecture the term is often employed as synonymous with choir (q.v.).

Chan'cellor, Charles Williams, American physician: b. Spottsylvania County, Va., 19 Feb. 1833. He studied at Georgetown College, and the University of Virginia, 1848-52, and was graduated at Jefferson Medical College, Philadelphia, 1853. During the Civil War he was medical director of Gen. Pickett's division in the Confederate army, 1863-5. He was professor of surgery in and dean of Washington University, Baltimore, 1868-75; secretary of the Maryland State board of health, 1875, president of the Maryland State Insane Asylum, 1880; and United States consul at Havre, France, 1893-7. Among his numerous reports and articles on medical and sanitary topics are the following: 'Report upon the Condition of the Prisons, Reformatories, and Charitable Institutions of Maryland' (1875); 'Contagious and Infectious Diseases' (1878); 'Mineral Waters and Seaside Resorts' (1883); 'Drainage of the Marsh Lands of Maryland' (1884); 'Hereditry' (1886) 'Sewerage of Cities' (1886); 'Climate of the Eastern Shore of Maryland.'

Chancellor, Richard, English navigator: d. 10 Nov. 1556. He seems to have been brought up in the household of the father of Sir Philip Sidney, and was chosen in 1553 as captain of the *Bonaventure* and pilot-general of Sir Hugh Willoughby's expedition in search of a northeast passage to India. The ships were parted in a storm off the Lofoden Islands, and Chancellor, after waiting seven days at Vardöhus, the rendezvous agreed upon, proceeded alone into the White Sea, and traveled thence overland to the court at Moscow, where he was very hospitably treated, and was able to conclude a treaty giving freedom of trade to English ships. His interesting account of Russia was published in Hakluyt's 'Navigations.' Next spring Chancellor rejoined his ship and returned to England, where his hopeful reports led to the establishment soon after of the Muscovy Company. In the summer of 1555 he made a second voyage in the *Bonaventure* to the White Sea, and was at Moscow once more in the succeeding winter. In July 1556, he set sail on his voyage homeward, but was lost in the wreck of his ship in Aberdour Bay off the Aberdeenshire coast.

Chan'cellor, an officer supposed to have been originally a notary or scribe, under the emperors, and named *cancellarius*, because he sat behind a lattice, called, in Latin, *cancelli*, to avoid being crowded by the people. There are, however, other derivations of this title. Whatever may have been its origin, the office and name of chancellor were undoubtedly known at the court of the Roman emperors, where the title seems to have signified originally a chief scribe or secretary, who was afterward invested with several judicial powers, and with superintendence over the other officers of the empire. From the Roman empire the title and office passed to the Roman Catholic Church, and hence every bishop has to this day his chancellor, the principal judge of his consistory. When the modern kingdoms of Europe were established upon the ruins of the empire, almost every state preserved its chancellor, with different jurisdictions and dignities according to their different constitutions. In all he seems to have had the supervision of all charters, letters, and such other public instruments of the Crown as were authenticated in the most solemn manner, and therefore, when seals came into use, he had always the custody of the king's great seal. This officer has now great authority in all the countries of Europe.

The *Lord High Chancellor of Great Britain* (originally of England) is the first judicial officer of the Crown and exercises an extensive jurisdiction as head of the supreme court of judicature. He ranks as first lay person of the state after the blood-royal. He is always one of the commissioners appointed to represent the sovereign in opening and closing Parliament or giving the royal assent to bills. He is created by the delivery of the great seal into his custody. In like manner the act of taking away the seal by the sovereign formally determines his office. He is a cabinet minister and a privy councilor in virtue of his office, is speaker of the House of Lords by prescription, and vacates his office with the ministry which appoints him. He has a salary of £10,000. He has the appointment of all justices of the peace in the

CHANCELLORSVILLE

kingdom, is visitor, in the king's right, of all royal foundations, and patron of all Crown livings under the value of 20 marks in the king's books. The office having in early times been always filled by ecclesiastics (for no others were then capable of an employment requiring so much writing), he became keeper of the king's conscience; and by special appointment he now exercises a general superintendence as guardian over all infants, idiots, and lunatics, though these latter powers are not necessarily attendant on his office, as Blackstone seems to have imagined, but can be delegated by the Crown to any other judicial officer, as in fact they were delegated even as late as the reign of James I., when the seals were held by Dr. Williams, then dean of Westminster, and afterward bishop of Lincoln. The great seal has been not unfrequently put in commission, and was last so on the resignation of Lord Thurlow in the year 1793. One vice-chancellor was appointed to preside in the courts of equity by 53 George III., c. 24, and two by 5 Vict. c. 5, § 19. The two last-mentioned were at first subordinate vice-chancellors, but they were afterward all made of equal rank. They sat in separate courts, and an appeal lay from their decisions to the lord chancellor. They latterly sat in the chancery division of the supreme court of judicature. See CHANCERY; SUPREME COURT OF JUDICATURE.

Chancellors of Ireland and Scotland.—There is a lord high chancellor of Ireland, who is the head of the judicial bench, with a salary of £8,000. He is not a member of the British ministry. The chancellorship of Scotland was abolished at the union. The Scottish chancellor had no independent jurisdiction in equity, as there has never been a separate court of equity in Scotland; but he presided in Parliament, and was head of all the courts of judicature, and of the Scottish office of chancery, in which all charters and other writs appointed to pass the great seal were recorded. This office still exists under a director of chancery.

The *Chancellor of the Exchequer* is the principal finance minister of the government, and as all questions of supply originate in the House of Commons, a peer cannot be conveniently appointed to this office. When the first lord commissioner of the treasury is a commoner, the two offices have sometimes been united.

The *Chancellor of the Duchy of Lancaster* presides in the court of the duchy chamber, to decide questions relating to lands holden of the king as Duke of Lancaster; but it does not appear that this is a court of record. The chancellorship is generally bestowed during pleasure, though there are two instances of its being granted for life; the last being that of the celebrated Lord Ashburton. The Chancellor of the Duchy of Lancaster is a cabinet minister.

The *Chancellor of a University* is an official at the head of the university, generally a man of rank, whose duties are more or less nominal, but who is regarded as conferring the degrees. At Oxford his duties are almost entirely discharged by the vice-chancellor; the chancellor's own acts being limited to the signing of diplomas, etc. Under the vice-chancellor are four pro-vice-chancellors, nominated by him from among the heads of colleges, to one of whom, in his absence from the university, he delegates his authority. The chancellor of Cambridge Uni-

versity, whose duties are very similar to those of the Oxford official, is elected biennially by the Senate; but there is no instance, at least in modern times, where a re-election has not taken place.

Chancellor of the Order of the Garter and Other Military Orders, an officer who seals the commissions and the mandates of the chapter and assembly of the knights of the order, keeps the register of their proceedings, and delivers their acts under the seal of their order. The title "chancellor" is given, in England, to several officers of other bodies.

Chancellors of Other European Countries.—The chancellor was one of the highest officers in the German states, and by the influence of his office was one of the most important. In Germany this dignity was from the remotest times vested in one of the higher clergy, until the head of the German clergy, the Archbishop and Elector of Mainz, united it forever with his office as Arch-chancellor of the empire. The two other spiritual electors held the same dignity, but it was merely titular; the Archbishop of Cologne, as Arch-chancellor of Italy; the Archbishop of Trèves, as Arch-chancellor of Gaul and Arles, that is, the kingdom of Burgundy, once belonging to Germany. The Arch-chancellorship of Mainz, on the contrary, had important duties attached to it—the direction of the Diet and of the public business, as well as of all the imperial chanceries. The Elector appointed a vice-chancellor, who was the actual minister of the empire at the imperial court. In the new German Empire the chancellor (*Reichskanzler*) is the president of the Federal Council (*Bundesrath*), and has the general conduct of the imperial administration. All laws of the empire, after being sanctioned by the emperor, must be countersigned when promulgated by the chancellor.

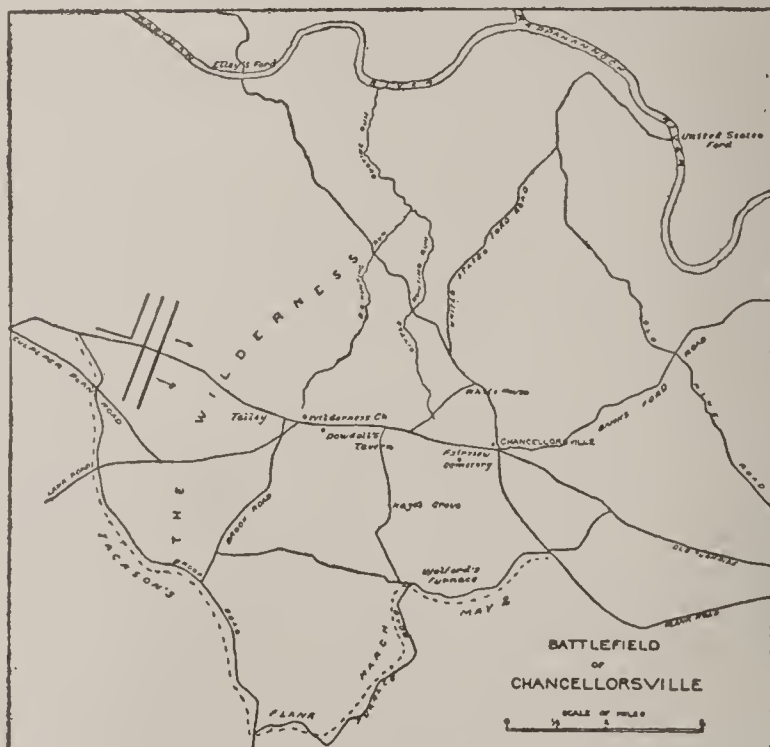
The Chancellor of France was the highest officer of state, and the only one who, when once appointed, could not be dismissed. In case, therefore, it was desired to remove him from participation in affairs, a keeper of the seals (*garde des sceaux*) was appointed. As the chancellor was properly the minister of justice, he was chosen from the body of jurists. A relic of his spiritual character was, that all his furniture, liveries, and even his coach, were black.

Chan'cellorsville, Battle of. The Chancellorsville campaign included the battle of Chancellorsville, 1–3 May 1863, the action at Marye's Heights, 3 May 1863, and the engagement at Salem Church, 3 and 4 May 1863. In the fore part of April 1863 the Army of the Potomac, under Gen. Hooker, and the Army of Northern Virginia, Gen. Lee, confronted each other on opposite sides of the Rappahannock at Fredericksburg. Lee was so strongly entrenched on the south side of the river from Port Royal on the right to Banks' Ford on the left, a distance of 25 miles, that an attack on his front was not to be thought of, and Hooker concluded to march his cavalry far beyond and around Lee's left, destroy his communications with Richmond, and compel him to leave Fredericksburg, when he proposed to fall on his flank and rear as he fell back. For this purpose Gen. Stoneman with 10,000 cavalry was put in motion, 13 April, under orders to ascend

CHANCELLORSVILLE

the Rappahannock, cross it west of the Orange & Alexandria R.R., attack Lee's cavalry wherever found, and plant himself firmly across his line of retreat. Stoneman found the Rappahannock and other streams so swollen by heavy rains that he was compelled to abandon the movement, and Hooker modified his plans. He determined to flank Lee's position and compel him to come out and fight on open ground of Hooker's own choosing. Lee had, in and around Fredericksburg, exclusive of cavalry, about 60,000 men and 170 guns; the two divisions of McLaws and R. H. Anderson of Longstreet's corps, and Jackson, with the divisions of A. P. Hill and D. H. Hill, commanded by R. E. Rodes; Trimble, commanded by R. E. Colston and J. A. Early. Hooker had, not including his 12,000 cavalry, about 118,000 men and 380 guns, divided into seven corps: First, Gen. J. F. Reynolds; Second, D. N. Couch; Third, D. E. Sickles; Fifth, Geo. G. Meade; Sixth, John Sedgwick; Eleventh, O. O. Howard; Twelfth, H. W. Slocum. Both armies were in the best of condition. On the 27th the Eleventh and Twelfth corps marched for Kelly's Ford, 25 miles up the Rappahannock, arriving on the 28th, and being joined by the Fifth corps, all crossed the river next morning, the Eleventh and Twelfth corps marching for Germanna Ford on the Rapidan, the Fifth corps for Ely's Ford, lower down the same stream. Pleasanton's cavalry brigade accompanied the two columns. Some opposition was met at the fords, and at 2 P.M. of the 30th, after some sharp encounters with Stuart's cavalry, on the Germanna road, the three corps united at Chancellorsville, 11 miles west of Fredericksburg, and were joined the same day by two divisions of the Second corps, under Couch, which had crossed the Rappahannock at United States Ford, the Third corps also being near. The cavalry was thrown out on the roads toward Fredericksburg and Spottsylvania. Hooker had concentrated with great ability 71,000 men on Lee's left and joined them before night. Mahone's and Posey's brigades of Anderson's Confederate division had been guarding United States Ford; the passage at Germanna Ford turned this position, and the two brigades on the 29th fell back to Chancellorsville, where Anderson had come up with Wright's brigade. Next morning Anderson fell back with the three brigades to near Tabernacle Church, four miles, and began to throw up works covering the roads converging at that point. These movements on Lee's left were covered by demonstrations on his right and front below Fredericksburg. They began as early as the 21st, and on the 29th Sedgwick, with the First, Third, and Sixth corps, moved to points two to four miles below town, threw pontoon bridges across the river, and crossed troops to hold them. On the 30th he was ordered to demonstrate on Lee's right down the river, and the Third corps marched by the north bank of the river for Chancellorsville. Sedgwick's movements did not deceive Lee. On the afternoon of the 29th Stuart had informed him that heavy Union columns were marching for the Rapidan, and he ordered Anderson to march with Wright's brigade to Chancellorsville. When informed that Hooker had crossed the Rapidan he ordered McLaws, leaving Barksdale's brigade on Marye's Heights, to march with three brigades, at midnight of the 30th, and take posi-

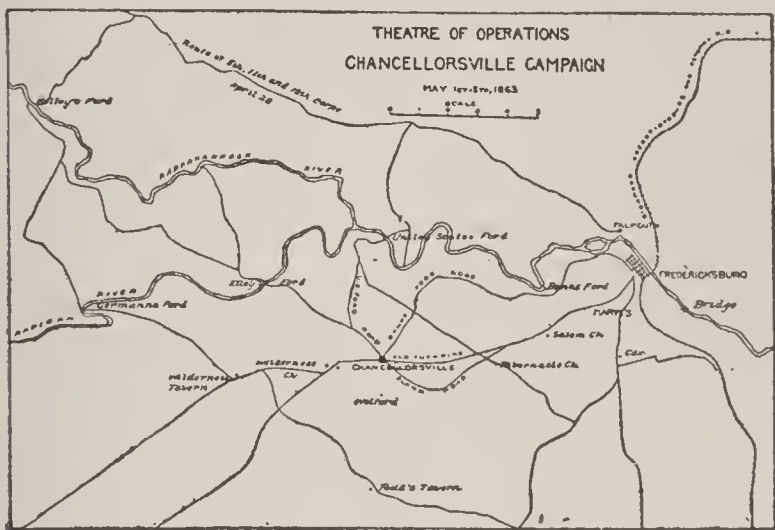
tion on Anderson's right. Jackson was ordered with three divisions to Chancellorsville, leaving Early's division with Barksdale's brigade—in all, about 8,500 men, and 30 guns—to hold the lines at Fredericksburg against Sedgwick. McLaws arrived on Anderson's right about daylight, and was joined by two of Anderson's brigades from near Banks' Ford. Jackson marched at 3 o'clock on the morning of 1 May, and came up to Anderson at Tabernacle Church at 8, suspended work on the entrenchments and, at 11 o'clock, ordered McLaws and Anderson forward on the two roads leading to Chancellorsville, his own three divisions following Anderson. Three roads lead from Chancellorsville to Fredericksburg, the most direct, the old turnpike, passing Salem Church. The second, the plank road, led south from Chancellorsville, then east, uniting with the turnpike beyond Tabernacle Church. Both these roads were covered by Anderson's works. The third road led northeastward, passed Banks' Ford, about six miles distant, and continued to Fredericksburg. It was 11 o'clock, 1 May, when Meade pushed out two divisions on the Banks' Ford road and one, Sykes', on the turnpike, under orders to



be at or near Banks' Ford at 2 P.M., and at the same hour, 11 A.M., Slocum advanced on the plank road, to be at Tabernacle Church at noon, Hooker's intention being to get out of the Wilderness, uncover Banks' Ford, and form for battle in open, elevated country, his right at Tabernacle Church, his left covering Banks' Ford. Meade's left divisions had come in sight of Banks' Ford; Sykes, supported by Hancock's division, Second corps, had encountered McLaws and driven him back nearly to Anderson's works; Slocum, over two miles out, had met Jackson and was sharply skirmishing with him; and all was going well, when Hooker, impressed by the unexpected advance of the enemy, and fearing his own inability to get entirely out of the tangled forest, onto open ground, before being beaten in detail, ordered the columns back to Chancellorsville, thereby giving up the advantage of position practically gained and losing the confidence of his corps commanders. Jackson and McLaws followed the retiring troops and felt the lines with skirmishers, and McLaws got guns in position and cannonaded the left of the line. Hooker's line,

CHANCELLORSVILLE

as completed on the morning of the 2d, extended from the Rappahannock on the left to a point on the Germanna plank road full two and a half miles west of Chancellorsville. The Fifth corps and a division of the second was on the left, facing east, the right in advance of the Chancellor House. The Twelfth corps was south of the plank road, its left less than one fourth of a mile in front of the Chancellor House, its right near Hazel Grove, a little over a mile southwest of Chancellor's. Birney's division of the Third corps was on the right of the Twelfth, and the Eleventh corps continued the line from Dowdall's tavern westward beyond Talley's farm. The works held by the Twelfth, Third, and Eleventh corps faced south, those of the Twelfth in form of a bow, the plank road being the string of the bow; those of the Eleventh ran in a straight line generally just south of the road. For nearly the entire distance the line ran through an almost impenetrable forest of scrub-oak and pine. There was a spacious clearing around the Chancellor House, where Hooker had his headquarters, and open ground around Dowdall's. A division of the Second corps and two of the Third were in reserve. Pleasanton's cavalry was near



Chancellor's House. On the evening of 1 May Lee had a conference with Jackson. To attack Hooker's 71,000 men, behind works, with 48,000, was certain to entail a terrible loss of life, and it was determined that Jackson, with nearly 30,000 men, infantry, cavalry, and artillery, should march across Hooker's front and assail his right flank and rear, Lee remaining with McLaws' and Anderson's 18,000 men to watch his left, demonstrate on it, and guard the roads to Fredericksburg. Jackson moved on the morning of the 2d with his accustomed celerity, and about 4.30 P.M. his head of column was on Hooker's right and rear, and he began to form line a scant mile from the right flank of the Eleventh corps. His movement had been discovered and misunderstood. As early as 9 o'clock he was seen marching a mile or so to the south; information of the fact was sent to Slocum and Howard, and instructions to both to strengthen their flanks. Hooker soon came to the conclusion that Lee was retreating, and about 1 P.M. Sickles, at his own request, was ordered to take two divisions of the Third corps, move out and attack, which he did, falling on Jackson's rear at Welford's Furnace, taking some prisoners. Barlow's brigade of the Eleventh corps was sent to Sickles, and Pleasanton's cavalry joined him, but the forest was too dense for cavalry operations, and Pleas-

anton withdrew two of his regiments and battery to Hazel Grove, where Sickles had left some of his artillery. Williams' division of the Twelfth corps was sent from its works to form on Sickles' left, attack Anderson's left and roll him back on Chancellorsville. Williams was about to attack when Jackson fell on the flank of the Eleventh corps, and he went back to his works. The Eleventh corps was badly posted and, though repeatedly informed by brigade and regimental commanders and picket officers of the gathering enemy on the flank, the superior officers, with one exception, lulled into security by the pleasing reports that Jackson was retreating, made no adequate provision against a flank attack, and most of the men were preparing supper when the storm broke. Jackson had formed his 26,000 infantry in three lines across the plank road, a mile on either side of it, artillery in the road, and a little after 5 o'clock gave the order to advance. The lines advanced with a rush, startling the game in the forest. The Union skirmishers were quickly driven in, and with a wild yell the main Confederate line struck the right brigade of Devens' division, flanked it, and after two or three rounds had been fired it gave way, the enemy following, striking and flanking everything in the way. No troops in the world, so placed, could stay such an attack. Some regiments made heroic stand and fought brilliantly, but in 30 minutes Devens' division of 4,000 men, was routed and the Confederates advanced upon Schurz's division, which had changed front. Schurz held ground about 20 minutes, and then fell back upon Buschbeck's brigade, east of Dowdall's. Here Schurz rallied some of his men. Buschbeck stood three quarters of an hour, and it was after 7 o'clock, when, attacked in front and flank, he fell back in good order to Fairview, where 40 guns of the Eleventh and Twelfth corps were being massed on high ground in his rear. Howard's corps had been driven two miles in less than two hours, losing nearly 1,500 killed and wounded, and 1,000 prisoners. The force of Jackson's attack had spent itself; his two leading divisions—Rodes' and Colston's—had become inextricably mixed; the men were tired and hungry, and Jackson suspended their further advance and ordered A. P. Hill to relieve them. Meanwhile Hooker had sent Berry's division, of the Third corps, and Hays' brigade, of the Second, to the west edge of the open field north of the road; on Berry's right were some of Schurz's regiments; and Williams, desisting from his attack on Anderson, regained part of his works and formed south of the road on Berry's left, Buschbeck in his rear. This covered the road at a distance of a little over a half mile west of Chancellor's House. Sickles, when informed of Howard's disaster, fell back from Welford Furnace to Hazel Grove, and formed on Pleasanton's left. Barlow drew up in Pleasanton's rear, all close to Williams' left and front. The two Confederate lines fell back to the open ground around Dowdall's, to re-form, and A. P. Hill was brought up and his leading brigade pushed along the plank road beyond the intersection of a road leading left to White House, and United States Ford, the road to be taken by Hill to cut off Hooker's retreat. While Jackson was reconnoitering on this road, beyond his main line, skirmishing began between the opposing pickets in the woods, and as

CHANCELLORSVILLE

Jackson, with his staff and orderlies, was riding back, the mounted body was mistaken for Union cavalry, and fired into, Jackson (about 9.20 P.M.) was wounded in three places, both arms being shattered. Nearly the entire escort were also killed or wounded. Jackson died 10 May. At the sound of the firing in the woods the Union guns on Fairview opened a furious fire down the plank road, causing some confusion to the Confederate column on it. During this fire A. P. Hill, next in command, was wounded; the intended advance was suspended, and Gen. J. E. B. Stuart was sent for to take command. During the night and early morning some changes were made in the Union line by which the approaches on the right to United States Ford were covered by Reynolds' corps and part of Meade's, and the Eleventh corps took position on the extreme left vacated by Meade. At 9 P.M. Hooker, not knowing that Sedgwick's entire corps was at Fredericksburg, ordered him to cross from Falmouth and march up the south side of the river to Chancellorsville, and attack Lee's rear at daylight, 3 May, while he attacked in front. Pleasanton and Sickles were ordered to fall back from Hazel Grove at dawn. Pleasanton marched back at 4 o'clock, and Sickles was following when his rear was caught by the oncoming Confederate line. Stuart, who had assumed command of Jackson's corps, advanced at 5 o'clock, 3 May, with great impetuosity, his right attacking Sickles as his rear brigade was about retiring from Hazel Grove. The brigade was soon driven, four guns were captured, and Stuart swept on. Thirty Confederate guns were put in position at Hazel Grove which swept the open ground of Fairview and poured an enfilading fire on the right of Geary's division of the Twelfth corps, which was fighting Anderson, and at the same time Geary's left was being pounded by McLaws' guns. The battle now became fierce along the entire line of the Second, Third, and Twelfth corps. On the right Stuart's men fought French's division of the Second corps and the three divisions of the Third, taking the Union works, being driven from them, and retaking them. Williams was fighting Stuart's right, Geary of the Twelfth corps was desperately engaging Anderson, and on his left, covering Fredericksburg road, Hancock's division of the Second corps was resisting the fierce attacks of McLaws. Stuart gradually gained ground and united his right with Anderson's left near Hazel Grove. The Union ammunition began to fail, and finally, about 9 o'clock, French, of the Second corps, the Third corps, and Williams' division of the Twelfth, after frightful losses, began to fall back, and the Confederates gained the west of the Chancellor plateau and swept it with artillery. A cannon-shot struck a pillar of the Chancellor House against which Hooker was leaning. He was knocked down and stunned, and Couch, who was second in command, was instructed by Hooker to withdraw to a position, already selected, about three fourths of a mile north of the Chancellor House, and covering United States Ford. The right and centre, closely pressed, fought their way back; Geary, attacked in front, right flank, and rear, followed; Hancock followed Geary; before noon the troops were in the new position; and here the battle of Chancellorsville proper ended, for, before

Lee had completed preparations to renew his attack, he heard of the capture of Fredericksburg and Marye's Heights and the advance of Sedgwick. Suspending further operations against Hooker, he turned his attention to Sedgwick, sending McLaws' division to oppose him.

When Sedgwick received Hooker's order of 9 P.M., 2 May, to cross the river at Fredericksburg, he had already done so and was three miles below the town. It was 11 P.M. when he received the order; he had 14 miles to march before he could reach Chancellorsville; and an enemy barred the way. He had about 23,000 men. His three divisions were commanded by Gens. John Newton, W. T. H. Brooks, and A. P. Howe. Brooks was left below Fredericksburg, and Newton led the advance on the town. The night was dark; progress was slow; frequent halts being made while the skirmishers were feeling the way; it was the gray of the morning when Newton reached the rear and left of Fredericksburg; and as daylight came Marye's Heights were seen to be held by the enemy. Gibbon crossed the river from Falmouth and reported to Sedgwick with his division, and under cover of a demonstration by Newton, advanced on the right to turn the position, but was stopped by the canal and a concentrated fire of artillery. He found also that Hays' brigade of Early's division, and Wilcox's of Anderson's were in his front, and he was obliged to fall back. On the other flank Howe's division failed to make an impression. Nothing remained but to assault the heights, and storming columns were formed, Howe forming three on the left, and Newton, two, of two regiments each, strongly supported. These were launched against the Confederate position, and were bloodily repulsed by Barksdale's brigade. The assault was renewed and Marye's Heights carried about 11 o'clock, with a loss to Sedgwick of nearly 1,000 killed, wounded, and missing, in a very few minutes. He took 15 guns and nearly 1,000 prisoners. Here a delay occurred to get Brooks' division up, which was to take the advance, and it was 3 o'clock before Sedgwick marched for Chancellorsville, leaving Gibbon to hold the town and cover the bridges there. His march was impeded by Wilcox, who had regained the road in his front and made a stand half a mile in advance of Salem Church, where McLaws had now come up and formed across the road. Brooks' division advanced and Wilcox fell back to the church, Brooks closely following, and a desperate encounter raged around the church, in which at first Brooks, supported by Newton, was successful, but was finally compelled to fall back after losing 1,500 men. Dispositions were made to renew the struggle, but night came and both sides slept on their arms. Early, who had concentrated his command at Cox's, on the telegraph road, south of Fredericksburg, had Lee's permission to attack Marye's Heights and Sedgwick's rear at daylight. He was joined by Barksdale and, as Marye's Heights were held by a small Union force, his attack succeeded. Leaving Barksdale to hold the heights and prevent an advance of Gibbon, who was in the town, Early moved toward Salem Church and asked McLaws to co-operate with him. Meanwhile Lee, retaining only Jackson's three depleted divisions to confront Hooker at Chancellorsville, led Anderson to unite with McLaws and Early, and drive

CHANCERY

Sedgwick across the Rappahannock, the three divisions aggregating about 21,000 men. Anderson arrived about noon of the 4th, and took position between McLaws and Early. Sedgwick was now hemmed in on three sides, his line in shape of a horseshoe, both flanks on the river covering Banks' Ford. The line was five or six miles in length, Newton, on the right, facing McLaws on the west; Brooks, in the centre, facing south, confronting Anderson, and Howe, on the left, facing east, opposing Early. Skirmishing was kept up during the day, and at 6 o'clock, Lee, after reconnoitering the position, ordered an attack to break the centre. Newton was not seriously attacked, but Howe and Brooks were assailed with great spirit, Early, falling upon the former and endeavoring to turn his left, in which he did not succeed, two of his brigades being repulsed and thrown into confusion by Howe's artillery. An attack on Howe's right and Brooks' left was also repulsed. The Confederates continued the contest until darkness put an end to it. Sedgwick then withdrew from the field to Banks' Ford, where he was covered by 34 guns on the north side of the river, but he had lost so heavily and was hemmed in so closely that, with Hooker's approval, he crossed the river during the night, taking with him nine captured guns and about 1,400 prisoners. His loss, since crossing the river on the 2d, had been 3,200 killed and wounded and 1,500 captured. During the night Gibbon recrossed the river to Falmouth, and on the morning of the 5th Lee was again in full possession of the south side of the river below Chancellorsville. Early was left to hold Fredericksburg, and Lee marched back with McLaws and Anderson to renew the battle with Hooker. A heavy storm came up, converting dry ravines into torrents and the soil to deep mire, and the attack was deferred until next morning. When day came Hooker had recrossed the river at United States Ford, and the Army of the Potomac marched to its old camp, and Lee returned to his old position at Fredericksburg. The Union loss at Chancellorsville was 1,082 killed, 6,849 wounded, and 4,214 missing. Including the losses at Fredericksburg, Marye's Heights, and Salem Church, the Union loss in the entire campaign, 27 April to 5 May, was 1,606 killed, 9,762 wounded, and 5,919 missing; an aggregate of 17,287. The Confederate loss during the campaign was 1,665 killed, 9,081 wounded, and 2,018 captured; an aggregate of 12,764. Consult: 'Official Records,' Vol. XXV.; Hotchkiss and Allan, 'Chancellorsville'; Abner Doubleday, 'Chancellorsville and Gettysburg'; S. P. Bates, 'The Battle of Chancellorsville'; T. A. Dodge, 'The Campaign of Chancellorsville'; A. C. Hamlin, 'The Battle of Chancellorsville'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. III.

E. A. CARMAN.

Chancery, formerly the highest court of justice for England and Ireland. It obtained its name from being under the presidency of the lord chancellor. It embraced six superior courts called high courts of chancery, and numerous inferior courts. The superior courts were the court of the lord high chancellor, the court of the master of the rolls; the court of appeal in chancery, constituted by the lord chancellor sit-

ting along with either of the two lords justices in appeal or by the two lords justices sitting together apart from the lord chancellor; and the courts of the three vice-chancellors. The ordinary legal jurisdiction of chancery embraced the issuing of writs for a new Parliament; of pleas of *scire facias* to repeal letters patent, and of all original writs. There was also a jurisdiction acquired by statute or special delegation in issuing writs of habeas corpus and inquiring into charitable uses. There were numerous other powers conferred by act of Parliament, and the lord chancellor, together with the lords justices of appeal, had exclusive authority over the persons and property of idiots and lunatics. Appeals in bankruptcy were heard by the court of appeal in chancery. The sittings and business of this court of appeal were regulated by the lord chancellor.

The procedure of the court of chancery at one time, by reason of its traditions and forms (commonly known as "red tape") became so cumbersome as partially to defeat its own ostensible aims, and rendered reform imperative. Charles Dickens made a determined attack upon the delays of chancery practice in his 'Bleak House,' and subsequent changes have been commonly attributed to his influence.

The English court of chancery is now a division of the high court of justice, which is itself one of the two departments of the supreme court of judicature (q.v.). The present judges of chancery, as a division of the high court of justice, are the lord chancellor, who presides over the division, and five justices, each of whom has the title of "Sir" and receives a salary of £5,000. According to the provisions of the act by which the supreme court of judicature was established, there were to be no more judges appointed than were already connected with the court; and the distribution of business, both as to its commencement and its transfer, was made subject to rules of court and orders of transfer. By the operation of these provisions chancery, like the other divisions of the court to which it now belongs, was gradually to cease to be a separate department; but in the meanwhile, subject to these rules and orders, certain causes and matters were assigned to chancery until these provisions should take their full effect. These are enumerated in the Supreme Court of Judicature Act (36 & 37 Vict. c. 66, § 34), and are (1) all causes and matters pending in the high court of chancery at the commencement of the act (finally fixed for 1 Nov. 1875); (2) all causes and matters to be commenced after the commencement of the act under any act of Parliament by which exclusive jurisdiction in respect to such causes or matters has been given to the court of chancery, or to any judges or judge thereof, except appeals from county courts; (3) all causes and matters for the administration of the estates of deceased persons; for the dissolution of partnerships or the taking of partnership or other accounts; for the redemption or foreclosure of mortgages; for the raising of portions or other charges on land; for the sale and distribution of the proceeds of property subject to any lien or charge; for the execution of trusts, charitable or private; for the rectification or setting aside or cancellation of deeds or other written instruments; for the specific performance of contracts between vendors and purchasers of real estates, including

CHANCRE — CHANDLER

contracts for leases; for the partition and sale of real estates; for the wardship of infants and the care of infants' estates. Chancery, as a division of the high court of justice, has no exclusive right to the administration of equity, the act already mentioned making provision under certain rules for the concurrent administration of law and equity in all the divisions of the supreme court of judicature. The court of appeal in chancery no longer exists, and its functions are transferred to the court of appeal, which in the new supreme court of judicature is the complementary department to the high court of justice. The affairs of lunatics are still under the supervision of the lord chancellor.

In the United States the general tendency has been likewise to abolish courts of chancery as separate departments, and equity jurisdiction is generally conferred on the courts of law. Delaware, New Jersey, and Tennessee are among the few States that still retain the former practice.

In the Catholic Church the chancery denotes (1) the office in a diocese whence come those documents necessary for the exercise of episcopal power; (2) the office in Rome which drafts and expedites the bills or briefs by which the mind of the pope is made known to Christendom or to particular suitors.

Chancroid, shank-roid, a contagious venereal disease characterized by the presence of one or more, often several, suppurative ulcers, chiefly located in the genital regions. These are due to infection by the organisms of dirt and are not true syphilitic lesions. Very frequently both hard and soft chancres are communicated at the same time, but they can be distinguished. Chancroid is definitely a dirt disease, and is due to uncleanness as well, perhaps, as to a specific micro-organism. Chancroid usually develops, within 24 to 48 hours after infection, as a minute macule, or pin-point vesico-pustule surrounded by a reddish halo. This increases day by day until a pustule or ulcer about the size of a small coin is developed. This ulcer is usually a soft ulcer. There is not much induration in the connective tissue beneath it, which is one of the distinguishing features between it and true syphilitic chancre. Chancroids are usually multiple, whereas chancres are usually single. They persist usually from three to six weeks and are often very difficult to cure, and furthermore a patient with chancroid may reinfect himself and thus spread the lesion at times very widely.

Chanda, chŭn'dä or chän'dä, India, chief town of the district of Chanda in the Nagpur division of the Central Provinces. It is surrounded by a stone wall five and a half miles in circuit, inside which are cultivated fields and detached villages, while there are also suburban quarters outside. There is a citadel now inclosing the jail, tomb of the Gond kings, three interesting temples, massive monoliths, etc. The town has a public park, civil station, and military cantonments. The manufactures include cottons, silks, brass utensils, etc. There is an annual fair beginning in April and lasting three weeks. Pop. 16,000.

Chandausi, chŭn- or chän-dow-sē', India, a town in the Northwestern Provinces, 27 miles south of Moradabad. It is the centre of a

considerable trade, especially in sugar and cotton, and has limestone quarries. Pop. 29,000.

Chandeleur (shän-dè-lèr) **Islands** lie east of Chandeleur bay, on the southeast coast of Louisiana. On the northern or smaller island is a fixed white light.

Chanderi, chŭn- or chän-da'rē, or **Chandhairee**, India, a town of Scindia's Dominions (Gwalior), Central India, 105 miles south of the town of Gwalior. It contains many ruins showing its former greatness and magnificence, but is now an insignificant place. The fort, which figures much in the wars of the Mogul dynasty, is on a hill, enclosed by a stone rampart, flanked with circular towers. Pop. 6,000.

Chandernagor, chŭn-dèr-nŭ'gōr or chän-dèr-na'gōr, or **Chandarnagar**, India, a town on the right bank of the Hooghly, 16 miles north-northwest of Calcutta. Its only manufacture is of cotton cloth, and there is no trade but with Calcutta. The French established a factory there in 1676, and in 1688 obtained a formal cession of it, together with its territory of about three and a half square miles, from Aurungzebe. It was three times taken by the British, first in 1757, but finally restored to the French in 1816. Chandernagor is under a sub-governor, subordinate to the governor of Pondicherry. Pop. of town and territory 26,000.

Chand'ler, **Abiel**, American merchant: b. Concord, N. H., 1778; d. Walpole, N. H., 22 March 1851. He was graduated at Harvard College in 1806, and was for many years a merchant in Boston. He died a widower, without children, and devised \$50,000 to Dartmouth College. The Chandler School of Science at Dartmouth was established in 1851 in pursuance of this bequest. For many years it was maintained as a separate department, but has recently been formally incorporated into the college and it is now known as the Chandler scientific course leading to the degree of bachelor of science.

Chandler, **Charles Frederick**, American chemist: b. Lancaster, Mass., 6 Dec. 1836. He studied at the Lawrence Scientific School of Harvard College, and at the universities of Berlin and Göttingen, receiving his doctor's degree at the latter in 1856. He was professor of chemistry in Union College, 1857-64, and professor of analytical and applied chemistry in the Columbia College School of Mines, 1864-1903. In 1858 he was elected to the chair of chemistry in the New York College of Pharmacy, and in 1876 to the chair of chemistry and medical jurisprudence in the College of Physicians and Surgeons. He became chemist to the Metropolitan Board of Health in 1865, and its president in 1873, being instrumental in securing great reforms in connection with the sanitary condition of the markets and the purity of the food-supply, notably in the case of milk. He is a member of the chemical societies of Berlin, London, and Paris, and of the National Academy of Sciences. With his brother, Prof. W. H. Chandler, he founded the 'American Chemist,' a monthly journal devoted to chemical science. To this and to the annual reports of the New York health department he has contributed many papers on chemistry, water-supply of cities, purification of coal gas, on petroleum, milk, sorghum, and glucose.

CHANDLER — CHANGA

Chandler, Elizabeth Margaret, American poet: b. near Wilmington, Del., 24 Dec. 1807; d. 22 Nov. 1834. Her most popular poem was 'The Slave Ship.' Many of her subsequent verses were written in the same strain, and published in the 'Genius of Universal Emancipation,' a Philadelphia abolitionist periodical. Her poems were published with a memoir by Benjamin Lundy (1836).

Chandler, Frank Wadleigh, American writer: b. Brooklyn, N. Y., 16 June 1873. He graduated at the Polytechnic Institute of Brooklyn, 1894; studied literature and philosophy at Columbia University, and at Oxford, London, and Paris, 1895-9. Since 1899 he has been professor of literature and history in the Polytechnic Institute, and since 1901 lecturer in comparative literature at Columbia. He has written 'Romances of Roguery, an Episode in the History of the Novel' (1899), and 'Some Theories of the Novel's Evolution in East and West' (1900).

Chandler, Richard, English archæologist: b. Elson, Hampshire, 1738; d. Tilehurst, Berkshire, 9 Feb. 1810. He was educated at Winchester and at Queen's and Magdalen colleges, Oxford. His first important work was 'Marmora Oxoniensia' (1763), an elaborate description of the Oxford marbles. He afterward traveled through Greece and Asia Minor, with Revett, architect, and Pars, a painter, at the expense of the Dilettanti Society, to examine and describe the antiquities. The materials collected were given to the world in the following publications: 'Ionian Antiquities' (1769); 'Ancient Inscriptions' (1774); 'Travels in Asia Minor' (1775); and 'Travels in Greece' (1776). Chandler was an Anglican clergyman and at his death was rector of Tilehurst, near Reading.

Chandler, Seth C., American astronomer: b. Boston, Mass., 16 Sept. 1845. He is well known for his investigations and observations of the phenomena of variable stars, the computation of comet orbits, and, in connection with Ritchie, for devising a system of astronomical code-telegrams for the announcement of astronomical discoveries. He also invented the Almucantar, and published a very complete treatise on the method of its use. He is best known for his exhaustive investigations of the variation of terrestrial latitudes.

Chandler, William Eaton, American politician: b. Concord, N. H., 28 Dec. 1835. He was graduated at Harvard Law School in 1855, entered the New Hampshire legislature in 1862, became judge advocate general of the navy department in 1865, and secretary of the navy in 1882, serving three years. In 1887-1901 he was a United States senator from New Hampshire.

Chandler, Zachariah, American statesman: b. Bedford, N. H., 10 Dec. 1813; d. 1 Nov. 1879. He received a common school education, and early in life went to Detroit, and engaged in the dry goods business, in which his energy and ability soon brought success and put him in possession of a handsome fortune. He was mayor of Detroit in 1851, the defeated Whig candidate for governor of Michigan in 1852, an active organizer of the Republican party in 1854, and in January 1857 was elected to the United States Senate to succeed Gen. Lewis Cass. He was re-elected in 1863 and 1869; then

served for a time as secretary of the interior in President Grant's cabinet, and was again elected to the Senate in February 1879. He opposed the admission of Kansas under the Lecompton constitution 1858, and he was the author of the famous "blood letter," in which he said "without a little blood-letting, this Union will not, in my estimation, be worth a rush." Though a warm friend of Lincoln, he was more radical than the latter, and often differed from him in matters of public policy. In July 1861 he introduced a sweeping confiscation bill which failed to pass and in July 1862 violently assailed McClellan in a speech in the senate. He was a man of imposing presence, fine judgment, great energy and perseverance. He was found dead in bed on the morning after delivering a political address in Chicago.

Chandler School of Science. See CHANDLER, ABIEL.

Chan'dos, the name of a noted English family, descended from a follower of William the Conqueror, the last representative in the direct male line being Sir John Chandos (d. 1428), whose sister married one Giles Brydges. Their descendant, Sir John Brydges, was lieutenant of the Tower under Queen Mary, and was created Baron Chandos in 1554. James Brydges (1673-1744), eighth Lord Chandos, sat in Parliament for Hereford from 1698 to 1714, and was created Duke of Chandos in 1719. The lucrative post of paymaster of the forces abroad supplied means for building a palace at Canons, near Edgeware, which cost \$1,000,000, but was torn down at the Duke's death. Here Handel lived two years, wrote anthems for the chapel service, and produced 'Esther.' In 1796 the title passed by marriage to the family of Grenville, now retaining the title of Duke of Buckingham and Chandos.

Chandpur, chünd- or chänd'-poor, India, a town in the Bijnaur district of the Northwest Provinces, about 40 miles east-northeast of Meerut. It is thriving, well paved, and drained; there is a trade in sugar and grain, besides some manufactures of cotton cloth, pipes, etc. Pop. 13,000.

Chang-Chau, chäng'-chow', China, a city in the province of Fokien, 35 miles west-northwest of Amoy, which is its port. It stands in a valley surrounded by hills and intersected by a river. Its walls are about four and a half miles in circuit, and immediately within is a space planted with large trees. It is the centre of the silk manufacture of the province. Pop. about 900,000.

Chang-Sha, chäng'-shä', China, capital of the province of Hu-Nan, on the Siang River. It is not a treaty port, but has an important native trade carried on in small boats. A telegraph station is projected and in 1900 surveys were completed for a railway. Pop. about 350,000.

Chan'ga, a species of mole-cricket (*Scapteriscus didactylus*) injurious in Porto Rico. The changa is found throughout that island, living in galleries in the earth, and damaging the crown and roots of the tobacco, cane, and small crops; it is the most serious insect pest in the island. (See MOLE-CRICKET.) Consult Barrett, 'The Changa, or Mole-cricket'; 'Bulletin No. 2, Porto Rico Agricultural Experiment Station,' Washington, 1902.

CHANGARNIER — CHANNELING-MACHINE

Changarnier, shän-gär-nē-ā, **Nicholas Anne Theodule**, French general: b. Autun 26 April 1793; d. Versailles 14 Feb. 1877. He was educated at Saint-Cyr, and went in 1830 to Algeria, where for 18 years he saw much active service. On the proclamation of the republic in 1848 he acted as provisional governor-general of Algeria, but returned to Paris to take command of the garrisons of Paris and of the national guard. He did much to check the outbreaks of the anarchist party during 1849. At the *coup d'état* in December 1851, after being imprisoned in Ham, he went into exile till the Franco-Prussian war, when he offered his services to Napoleon III. He was in Metz with Bazaine, and, on its capitulation, retired to Brussels. He returned to France in 1871, entered the assembly, and assisted M. Thiers in reorganizing the army.

Change of Colors. See CHATOYANCY.

Change of Function. During the metamorphosis of insects, *Crustacea*, and other animals, organs at first adapted for certain uses become, with change of conditions of life, media, and consequently of habits, adapted to quite different uses or functions. Thus in the young larva (Nauplius) of many of the lower *Crustacea*, the three pairs of head appendages are formed for swimming; the first two pairs afterward change into the two pairs of antennæ, the third pair becoming the jaws of the adult. In the tadpole, which lives on dead leaves or animal matter, the intestine is very long and coiled, but in after life, when the frog feeds on living insects, it is very much changed in form, being much shorter. There are many examples of change of function by suppression of the original or chief function, what was a minor use becoming the chief one. Other examples are the transformation of the jaws of biting insects into the needle-like elements, aiding in the formation of the beak of bugs (q.v.); the transformation of the hypopharynx of caddis-flies into the piercing organ of fleas and flies; the modification of the maxillæ of biting insects into the spiral tongue of the butterfly. The mouth-parts of bees and butterflies lost their primitive functions and adopted entirely new shapes and uses after flowers appeared. Among fishes the clearest example is the change of the swimming-bladder of the gar pike, where it also functions as a breathing organ, until in the lung-fishes, which have probably descended from some ganoid, it becomes a lung.

These changes of functions are due to change of the surroundings, and consequently of habits, finally bringing about change of function. Hertwig states that a muscle may from many causes become functionless, but finally becomes transformed into a ligamentous band. What are the gill-supports of fishes may, as the results in certain of their descendants of the adoption of a terrestrial mode of life, become in part degenerate, while another part persists by assuming a new function, forming the jaws, the hyoid bone, and the small bones of the ear, which are morphologically the same structures as the gill-arches. Consult: Dohm, 'Der ursprung der Wirbelthiere und das Princip des Functions nichsels'; Hertwig-Kingsley, 'Manual of Zoology.'

Change of Life. See MENOPAUSE.

Change'ling, a child left or taken in the place of another. It was at one time a common superstition that young children were liable to be stolen or changed by fairies before being baptized; and hence they were carefully watched till that ceremony was over. It was thought that the fairies were always anxious to change their own starveling elves for the more robust children of men. The children so left were called changelings, and were known by their greater backwardness in growth or learning; hence, stunted or idiotic children were regarded as changelings.

Chank-shell, the shell of a gastropod mollusk (*Turbinella rapa*). An extensive fishery of these shells, which live in water from 12 to 15 feet deep along the shores of Ceylon and India, has been established at Tuticorin. The shell is a sacred emblem of Vishnu, who is often represented as holding a "sinistral" one in his hand. They are used by the Hindu women as bangles and leg ornaments, or anklets. The chank appears as a symbol on the coins of some of the ancient Indian empires, and is still retained on the coinage of the Rajah of Franvacore.

Chanler, Amelie Rives. See TROUBETSKOY.

Chan'ler, William Astor, American explorer: b. Newport, R. I., 11 June 1867. He studied at Harvard, but left the university to make explorations in Africa. He was elected to the New York legislature in 1897, and to Congress in 1898 as a Democrat. He served in the war with Spain and was commended in Gen. Shafter's reports. He has written 'Through Jungle and Deserts' and 'Travels in Eastern Africa'; etc.

Chan'nel Islands, a group of islands in the English Channel belonging to Great Britain, off the west coast of the department La Manche, in France. They consist of Jersey, Guernsey, Alderney, and Sark, with some dependent islets; area, 75 square miles. They are picturesque and very fertile, and are celebrated for a peculiar breed of cattle, the chief strains of which are the Jerseys, Guernseys, and the Alderneys, which differ from each other in minor characteristics. The islands are almost totally exempt from taxation, and the people enjoy besides all the privileges of British subjects. There are two lieutenant-governors, one for Jersey, and the other for Guernsey, Alderney, and Sark. The government is in the hands of two corresponding bodies called the "states," some members of which are named by the Crown, while others are chosen by the people, and others sit *ex officio*. These islands have been fortified at an immense expense. Ecclesiastically they belong to the diocese of Winchester. The Channel Islands form the only remains of the Norman provinces once subject to the English crown. They now export large quantities of fruit, vegetables, and flowers to the English markets, including grapes, tomatoes, and potatoes, partly grown under glass. The fisheries also are important. French is generally spoken. Pop. (1901) 95,841.

Channeling-machine, a machine for cutting the channels in boot-soles, to allow the thread to bury itself in the leather and be protected from immediate wear. It consists of a knife, which makes an oblique cut in the sole to a gauged depth and regulated as to distance from the sole-edge by a guide.

CHANNELS — CHANNING

In stone-working the term is applied to a machine having a series of jumpers or chisels which make a groove across the face of a block in the quarry, or detached. It has a gang of cutters operated by direct-acting steam cylinder. The cutters have direct motion from the piston. The valve is reversed at the blow of the cutters; or, in case of no blow being given, it is reversed before the cylinder bottom is touched by the piston. The cutter-bar is adjustable on the cylinder-bar to suit the depth of groove cut. The whole mechanism is mounted on vertically adjustable rollers, and the feed device is operated from the cross-head.

Channels, or Chain-wales, of a ship, pieces of wood or iron projecting edgewise like a ledge from the ship's outside, abreast of and extending somewhat behind the masts. They serve to extend the shrouds and to prevent them from touching the gunwale, or being injured by rubbing against it.

Chan'ning, Blanche Mary, American author: b. Liverpool, England, about 1863; d. Brookline, Mass., 9 Aug. 1902. Her father was Rev. William Henry Channing (q.v.), an American clergyman, for many years in charge of a Unitarian Church in Liverpool, and she was a grandniece of the famous Dr. William Ellery Channing (q.v.). In 1890 she came to the United States and devoted herself to literary work and poster and book-cover designing. She was the author of 'Zodiac Stories' (1899); 'Winifred West' (1901); 'The Balaster Boys' (1902).

Channing, Edward, American historian: b. Dorchester, Mass., 15 June 1856. He graduated at Harvard in 1878, and in 1883 was appointed instructor in history there, becoming successively assistant and full professor of history. He has written: 'The Narragansett Planters' and 'Town and County Government of the English Colonies in North America' (Johns Hopkins Studies, 1883-4); 'Columbus and His Companions,' in Winsor's 'Narrative and Critical History of the United States' (1888); 'The United States, 1765-1865'; in collaboration with A. B. Hart, 'Guide to the Study of American History' (1896); and with T. W. Higginson, 'English History for Americans'; 'History of the United States' (1904); 'The Jeffersonian System' (1906). In 1882 he translated B. Delbrück's 'Introduction to the Study of Language.'

Channing, Edward Tyrrel, American scholar: b. Newport, R. I., 12 Dec. 1790; d. Cambridge, Mass., 8 Feb. 1856. He was a brother of William Ellery Channing, 1780-1842 (q.v.). He studied law with his elder brother, Francis Dana Channing, in Boston, and was admitted to the bar. He gave his attention chiefly to literature, and carried forward a careful and critical study of the Greek and Roman classics, with that of the great writers of England. The 'North American Review,' the earliest permanent periodical in America, had its origin in a club of young men, who, in the winter of 1814-15, projected a bi-monthly magazine. Willard Phillips, afterward author of the celebrated works on the law of insurance and of patents, was to be its editor. The committee on politics was composed of George Cabot, James Lloyd, John Lowell, Josiah Quincy, and others. The chief managers were to be President Kirkland, Jared Sparks, George Ticknor, Mr. Chan-

ning, Richard H. Dana, and John Gallison. At this time, William Tudor, author of the 'Life of James Otis,' returned from Europe with a matured plan for a quarterly review; and as the field was not large enough for two such works, the plan of the magazine was merged in that of Mr. Tudor, and the first number of the 'North American Review' was issued in May 1815, as a bi-monthly, the quarterly publication not being adopted until the commencement of the eighth volume. Tudor edited it for two years, and in 1817 it passed under the control of a club. Jared Sparks was chief editor for one year, when the duty was undertaken by Channing, aided by his cousin, Richard H. Dana. In October 1819, Mr. Channing was succeeded in the editorship of the 'Review' by Edward Everett, having been appointed Boylston professor of rhetoric and oratory in Harvard University. This post he held for 32 years, resigning it in 1851. During all this time, the department of rhetoric and oratory, including the charge of all the English compositions of the students, and carrying great influence over their reading and taste, was filled by him with more than satisfaction to the public of reading and thinking men.

He established and maintained for the college a high reputation for purity and elegance of style in composition and elocution, and gave direction to the reading of an entire generation of leading men in all departments of intellectual labor. He was a constant contributor to the 'North American Review,' almost to the time of his death. In 1856 a volume of his lectures to the senior class at Harvard was published. He was highly esteemed for the charm of his conversation, which was choice and pure in style, with an occasional use of a restrained but effective humor. He was a man of pure and just character, thoughtful and scholarly habits, with few and warm friendships; tolerant and liberal views of his fellow beings; a Unitarian of the old school in his theology, and a philanthropic conservative in his politics.

Channing, Francis Allston, English writer: b. United States 21 March 1841. He is a son of William Henry Channing (q.v.) and a brother of Blanche Mary Channing (q.v.) and was educated at Exeter College, Oxford. He has been prominent in advocating agricultural and educational reforms and has published 'Instinct'; 'The Greek Orators as Historical Authorities'; 'The Second Ballot'; 'The Truth About Agricultural Depression.'

Channing, William Ellery, American Unitarian clergyman: b. Newport, R. I., 7 April 1780; d. Bennington, Vt., 2 Oct. 1842. Entering Harvard College at 14 he took his degree in 1798 and though at first inclining to the study of medicine, presently decided upon the profession of the ministry. After his graduation he spent two years in Virginia as a tutor, but in pursuance of his ascetic views regarding renunciation, and the necessity of subduing the animal nature, he endeavored to accustom himself to hardships during this period, even denying himself sufficiency of food and clothing. The result of this unwise course was to implant in him the tendency to disease that made him for the greater part of his career a semi-invalid. Returning from Virginia he took up the study of theology, making at the start a careful study of the evidences of Christianity, wishing, as he

CHANNING

said, to know what Christ taught and not what men made him teach. In 1801 he was made regent of Harvard, the duties of this office being light, and the salary sufficient for his support while continuing his studies. In 1802 he preached his first sermon at Medford, Mass., from the text "Silver and gold have I none; but such as I have, give I thee." In 1803 he was ordained pastor of the Federal Street Church in Boston and continued in that relation for the rest of his life. In the earlier years of his ministry the denominational spirit was not especially strong in him and with the ministers of the Trinitarian churches in Boston, he was on most friendly terms. His opinions were ripening during this period, however, and in 1819, at the ordination of Rev. Jared Sparks in Baltimore, he preached a sermon in which for the first time he gave free expression to the principles of Unitarian Christianity, upholding the exercise of reason in religious matters; declaring the Bible to be "a book written for men in the language of men, and its meaning to be sought in the same manner as that of other books." He also objected to the doctrine of the Trinity, affirming his belief that Christ was distinct from and inferior to God, and sent to men as a great moral teacher, not as a mediator between erring man and offended deity. This discourse gave rise to much controversy and fixed definitely the Unitarian position as distinguished from that of the Trinitarians. It made him, moreover, the recognized leader of American Unitarianism, and much as he disliked controversy he never hesitated from uttering what he believed to be true because of hostile criticism. His greatest dread was of becoming creed-bound and thus losing perception of new truths, and he even spoke of himself as "little of a Unitarian," and standing aloof "from all but those who strive and pray for clear light, for a purer and more effectual manifestation of Christian truth." After 1824 Rev. Ezra Stiles Gannett was associated with him in the ministry of the Federal Street parish, and from this epoch his time was largely given to philanthropic and literary work, the asceticism of his youth having long since been supplanted by a more wholesome understanding of life and its requirements and duties. He visited Europe in 1822 and became acquainted with Coleridge and Wordsworth. He was one of the first to acknowledge the greatness of the latter, and save Shakespeare, he read no poet oftener. Channing was a fearless defender of freedom, and upheld Garrison when that great abolitionist was the most generally detested person in Boston. In the pulpit his mission, as he saw it, was to free men's minds from servile conceptions of God, to disabuse religion of its benumbing terrors, and to show forth to men the real significance of their moral natures. His writings on theological, social, and philanthropic themes have received the widest circulation and been translated into French, Italian, German, Icelandic, Russian, and Hungarian. The most notable of them include: 'Evidences of Revealed Religion'; 'Essay on National Literature' (1823); 'Remarks on the Character and Writings of John Milton' (1826); 'Character and Writings of Fénelon' (1829); 'The Duty of the Free States' (1835); 'Self Culture' (1838). He had a life-long abhorrence of slavery, but in his 'Duty of the Free States' his feelings on the

subject find fullest expression. His name, moreover, was associated with the most of the social reforms of his day and besides bearing a part in the great anti-slavery agitation, he warmly sympathized in the temperance movement, was an ardent lover of peace, and deeply interested in schemes for educational advance. He stood for intellectual and spiritual ideals and foresaw dangers both to nations and individuals, in the spread of materialism, in the contented adoption of inadequate aims, complacent satisfaction with perishable interests. In an age when comparatively few religious leaders dared to think outside of narrow prescribed limits, Channing stood forth as the intellectual champion of freedom. Much of his influence may have been due, no doubt, to the singular sweetness of his disposition, and his entire nobility of character, but more of it was due to the fact that he spoke with utter fearlessness and thus inspired other men to free themselves from the fetters of dogma or of intellectual timidity. Although two generations have passed since his death, his name is still both familiar and beloved, and his beneficent influence, far from lessening its hold upon men, has deepened and widened with the years. Channing's literary style, while not highly ornamental, was both clear and vigorous, and his sentences were usually short and direct, though it is said that his personal preferences in the writings of others were for long and involved sentences. On 1 June 1903, a bronze statue of Channing by Herbert Adams was unveiled in the public garden in Boston, Mass., its site being opposite the Arlington Street Church, the successor of the Federal Street Church, of which he was so long pastor. The statue and its monumental setting were the gift of John Foster to the city. See 'Lives' by W. H. Channing and C. T. Brooks; 'Correspondence of Channing and Lucy Aikin'; Peabody, 'Reminiscences.'

OSCAR FAY ADAMS,

Editorial Staff 'Encyclopedia Americana.'

Channing, William Ellery, American poet; nephew of William Ellery Channing, the elder: b. Boston, Mass., 10 June 1818; d. Concord, Mass., 23 Dec. 1901. After some years spent in newspaper work he retired to Concord, where he lived the life of a recluse. His writings include: 'Poems' (1843-7); 'The Woodman' (1849); 'Near Home' (1858); 'The Wanderer' (1872); 'Conversations in Rome' (1847); and 'Thoreau, the Poet-Naturalist' (1873); 'Eliot'; 'John Brown.'

Channing, William Henry, American clergyman: b. Boston 25 May 1810; d. London 23 Dec. 1884. His father, Francis Dana Channing, died when he was very young. He graduated at Harvard College in 1829, and entering the Unitarian ministry preached with much success in Meadville, Penn., New York, Cincinnati, Nashua, Boston, and Rochester. Settling in England, he succeeded James Martineau as pastor of the Hope Street Chapel in Liverpool 1852-62. He was for two years chaplain of the Senate at Washington, but from the close of the Civil War lived entirely in England. He published: 'Memoirs of Dr. William Ellery Channing' (1848); 'Life and Writings of James H. Perkins'; 'Memoirs of Madame Ossoli (Margaret Fuller),' in connection with R. W. Emerson and J. F. Clarke. His addresses and discourses were often extemporaneous and deliv-

CHANSON DE ROLAND — CHANTILLY

ered in a style highly impassioned and imaginative. During a considerable part of his career he was an earnest advocate of social reform. See 'Life,' by Frothingham (1886).

Chanson de Roland, the culmination of a cycle of 'Chansons de Geste' or 'Songs of Valor,' celebrating the heroic achievements of Charlemagne. They are inspired especially by the joy and pride of the triumph of Christian arms over the Mohammedan invasion, which, through the gate opened by the Moors of Spain, threatened to subdue all Europe. The French text of the 'Chanson' was first published in Paris by M. Francisque Michel in 1837, and afterward in 1850 by M. F. Genin. Tyrwhitt, in his edition of Chaucer, was the first to call the attention of English readers to the 'Chanson'; but English tradition has it that the song was sung by the Norman Taillefer just before the battle of Hastings. The best and oldest French MS., called the 'Digby,' is preserved in the Bodleian library at Oxford. The French poem contains 6,000 lines. A fragment of 1,049 lines, translated in Middle English from what is known as the Lansdowne MS., is published by the Early English Text Society.

Chansons de geste, shānsōn' de zhest', the romances of the Middle Ages sung or recited by wandering minstrels. Their number in French is very large; in English they are not so numerous and most of them are translations of a French original.

Chant, Laura Ormiston Dibbin, English lecturer and reformer: b. Chepstow, Monmouthshire, 1848. In 1876 she was married to Thomas Chant. She has taught in schools as well as nursed in hospitals and has lectured widely both in England and the United States on literary and scientific subjects, being a prominent advocate of woman's suffrage, temperance, etc. She has published: 'Verona and Other Poems'; 'Short Stories'; and several collections of original songs.

Chant, a short musical composition adapted to the singing of the psalms and canticles. Chants are single when adapted to a single verse, and double when adapted to two verses, the former consisting of two strains of three and four bars respectively, and the latter being of twice that length. More recently quadruple chants extending over four verses have been introduced. The complete chant consists of four parts, namely: (1) the intonation or initial phrase leading up to the reciting note; (2) the reciting note, which is the dominant of the mode employed; (3) the mediation, or main body of the chant; and (4) the termination or concluding phrase. In modern Anglican chants, however, there is no intonation. The origin of the plain song of the Church is unknown, but the first attempt to reduce the traditional music to some definite system was made by Saint Ambrose, bishop of Milan (d. 397). More important, however, by far is the Antiphonarium of Gregory the Great, which appeared in the latter half of the 6th century and soon established itself as the chief and in fact only authority on Church music. The Gregorian tones were introduced into England by Saint Augustine, and in the course of their history in that country they underwent many modifications in the various local "uses." During the Civil War and the Commonwealth they went out of use.

but were revived at the Restoration. Not long afterward, however, the Gregorian chants began to give place to the modern double chants, and it is only in quite recent years that attempts have been made to revive them. A new impetus has been given to the use and popularization of plain chant in recent times by the first encyclical letter of Pius X., his "*motu proprio*" and the introduction of Gregorian music in all the Catholic churches throughout the world. The form of chant most favored by the Holy Father is the Salesme method, a new school for which has just been opened (1904) by the Benedictine monks in the Isle of Wight. See GREGORIAN CHANT.

Chant du Depart, shān dü dā-pār (Fr. "Song of Departure"), a popular French military song of the period of the Revolution, written by the poet Marie Joseph Chenier, to the music of Méhul.

Chantabon, shān-tā-būn', or **Chantiban**, an important commercial port of Siam, on the east side of the Gulf of Siam, near the mouth of the Chantibun River. It is occupied by the French as security for fulfilment of the treaty of 1893. It is a place of considerable trade. Pop. (estimated) 30,000.

Chantal, shān-tāl, **Jane Frances Frémiot** (frām-yō) de, SAINT, French devotee, foundress of the order of the Visitation B. V. M.: b. Dijon, France, 1572; d. Moulins 13 Dec. 1641. The institute of the Visitation nuns was founded in 1610 at Annecy, and at her death it had 87 houses, and 60 years later 150 houses with 6,000 inmates—nuns and girls receiving a secular and religious education. She was canonized by Clement XIII. in 1767; her day in the Roman Calendar is 21 December. Her life and letters were published at Paris (1779).

Chanterelle, an edible mushroom (*Cantharellus cibarius*) of a bright orange color, with a pleasant fruity smell, growing in woods and on dry pastures. See MUSHROOM.

Chantibun. See CHANTABON.

Chantilly, shān-tē-yē, France, a town in the department Oise, 25 miles north-northeast of Paris, on the Nonnette, celebrated for its splendid château, built for the Duc d'Aumale in 1876. It stands on the site of an older château which first became important under Anne de Montmorency. In 1632 it passed to the house of Condé, but the greater part was demolished at the Revolution. The last prince of Condé bequeathed the domain to the Duc d'Aumale in 1830. The present building and domain, including fine grounds and gardens, an extensive forest, etc., were presented by the Duke to the French Institute in 1886. The château contains a valuable library and a precious collection of works of art. The place was formerly celebrated for its manufacture of lace ("Chantilly lace"). It is a great horse-racing and training centre. Pop. 4,500.

Chantilly, shān-tī'li, or **Ox Hill, Battle of**. On 31 Aug. 1862, the day after the second battle of Bull Run, Gen. Lee marched his army by way of Sudley Ford around Pope's right at Centreville, to seize Fairfax Court-House and interpose between Pope and Washington; and at night Jackson, who was in advance, bivouacked six miles west of Chantilly, on the Little River turnpike, Longstreet some distance in rear.

CHANTREY

Next morning Gen. Stuart informed Jackson that a part at least of the Union army was at Fairfax Court-House, and that Pope's trains were passing on the road from Centreville to that place. Jackson moved cautiously toward Fairfax Court-House, and on reaching Ox Hill, three miles east of Chantilly, was informed by Stuart that the Union force seemed very strong on the road in front. Then Jackson formed line on Ox Hill ridge, his artillery massed on the left of the road, his infantry on the right, extending in the direction of the Centreville road. He had not completed his formation when he became aware of an approaching force from the Centreville road, upon which he strengthened his right and threw out skirmishers. About 1 P.M. Pope, who had heard of Jackson's advance toward his rear, sent Gen. I. I. Stevens with nine regiments, about 3,000 men, of Reno's corps to gain the road two miles east of Chantilly and hold Jackson in check until the army could be brought into position at Fairfax Court-House. Stevens moved from near Centreville across the fields, unexpectedly struck Jackson's advancing skirmish-line, thrown out from his right, and drove it back into a body of woods. Jackson then advanced a regiment from the woods, which was immediately driven back by Benjamin's battery. Stevens now formed a column of assault, six regiments in three lines, two regiments in a line. At 4.30 P.M. he placed himself in the centre of this column of 2,000 men, on open ground, and ordered it forward, Benjamin shelling the woods in front. Not a sight nor sound betrayed the presence of an enemy, until the advancing column, ascending a gentle slope, came to within 75 yards of the woods, when from a worm fence bordering them, came a terrific volley from Branch's brigade, smiting the column with great effect, men going down by the score. At first it began to waver, but quickly bracing up returned the fire, five color-bearers of the 79th New York, Stevens' old regiment, went down in succession. The assault was checked, Stevens ran forward, seized the colors and, calling upon his men to follow him, all rushed forward, routed Branch, and gained the fence, Stevens falling dead on it, with a bullet through his brain and the colors upon his head and shoulders. The column pushed on into the woods. At the moment of reaching the fence a sudden and terrific thunderstorm and fierce gale burst over the field, blowing the rain into the faces of the men on both sides, impeding their movements and wetting their ammunition. Jackson brought up fresh men, and after a contest of more than an hour the six regiments were driven out of the woods and fell back to the point where they had formed, and on the right of where Birney's brigade of Kearny's division had come up. Meanwhile three regiments of Reno's command had been sent in on Stevens' right, one only of which, the 21st Massachusetts, became seriously engaged and was repulsed with great loss. Gen. Kearny now came up with a battery, which he put in position and went to the right for a regiment to fill an interval on Birney's right. He met the 21st Massachusetts as it came out of the woods, and was leading it to the left when his attention was called to the fact that the Confederates were advancing from the woods and through a cornfield on Birney. He spurred his horse into the corn-

field to reconnoiter, ran upon a skirmish-line, saw his mistake, and turned to ride back, when he was shot through the body and killed. A sharp encounter ensued between the 21st Massachusetts and the Confederates, which was ended by darkness; the regiment withdrew, the Confederates retired to the woods, and the battle was ended, neither side having permanently gained a foot of ground. The other two brigades of Kearny came up, and the ground was held until 3 o'clock in the morning of the 2d, when Kearny's and Reno's men fell back to Fairfax Court-House after the last of Pope's army from Centreville had passed. Pope fell back to Washington, and Lee marched to cross the Potomac into Maryland. The Union loss at Chantilly was about 800; that of the Confederates about 700. In the death of Kearny and Stevens the Union army lost two of its best officers. Consult: 'Official Records,' Vol. XII.; Hazard Stevens, 'Life of Gen. I. I. Stevens,' Vol. II.; G. H. Gordon, 'Army of Virginia.'

E. A. CARMAN.

Chantrey, chän'trī, SIR **Francis Legatt**, English sculptor: b. Jordanthorpe, Derbyshire, 7 April 1781; d. 25 Nov. 1842. The chief amusement of his boyhood was in modeling figures in clay and drawing likenesses, and at his own request he was apprenticed in 1797 to a carver and gilder at Sheffield. Here he attracted the attention of J. Raphael Smith, a mezzotinto engraver and portrait-painter, who, perceiving his decided inclination for drawing and modeling, gave him instructions which tended greatly to prepare him for his future career. By 1804 he was resident in London, studying at the Royal Academy. Having acquired much reputation as a sculptor, he became the successful candidate for the marble bust which the inhabitants of Sheffield had resolved to erect to the memory of the Rev. J. Wilkinson. This interesting work, which may be said to have finally decided his future course, is in Sheffield Parish Church. Having settled permanently in London, he presented numerous busts at the exhibitions of the Royal Academy. About the same time he was a successful candidate for a statue of George III. for the city of London, and soon was almost universally regarded as the first monumental sculptor of the day. In 1815 he was chosen an associate and in 1818 a member of the Royal Academy. In 1819 he visited Italy, where he was elected member of the academies of Rome and Florence. He was knighted in 1835. His most celebrated works are the 'Sleeping Children,' a monument erected to two children of the Rev. W. Robinson, in Lichfield Cathedral; the statue of Lady Louisa Russell, daughter of the Duke of Bedford, in Woburn Abbey; Lady Frederica Stanhope with her infant child, in Chevering Church; Sir Joseph Banks, at the British Museum; Roscoe and Canning, at Liverpool Town Hall; James Watt, at Glasgow; the bronze statue of William Pitt, in Hanover Square, London; and statues of Horner, Sir J. Malcolm, etc., in Westminster Abbey, and a statue of Washington in the State House at Boston, Mass. His finest works are his busts, among the best of them being Sir Walter Scott, Watt, Wordsworth, and Porson. His full-length figures are said to betray an insufficient acquaintance with anatomy, and several of his equestrian statues in bronze are still more defective. The

CHANTRY — CHAPARRAL-COCK

postures are formal, and the horses, in their bodies and limbs, are very inanimate. He made munificent bequests for the advancement of art, the Royal Academy being endowed with a large fund for the purchase of works of sculpture and painting by artists residing in Great Britain.

Chan'try (old French, *Chanterie*), an ecclesiastical endowment to provide for the celebration of masses for the prosperity of the living or repose of the dead. Previous to the Reformation chantries were very numerous, almost every family of importance having founded one or more. Wealthy founders would endow a church or monastery, in which religious services should be celebrated continually. For less wealthy founders, an altar in the church of the locality was made to suffice. Sometimes small chapels, called chantry chapels, were appended to the main edifice, and occasionally, as at Wakefield and Bradford-on-Avon, such chapels were erected on bridges. The residences of priests engaged in the services were known as chantry houses, chantries, or colleges. The Chantry schools were widely spread over England prior to the Reformation. Chantries were dissolved in England by King Edward VI., and nearly all endowments were devoted to the purposes of the Crown.

Chanute, cha-noot', Kan., a city in Neosho County, 125 miles southwest of Kansas City, Mo., on the Atchison, T. & S. F. and the Missouri, K. & T. R.R.'s. The city was incorporated in 1873. Manufactories here, including railroad shops, utilize the abundant natural gas of this locality, which is also used for lighting and various domestic purposes. The recent discovery of extensive oil-fields in the vicinity has led to a new and important industry, over 250 productive oil-wells having been opened. This industry promises rapid growth for the city, and also developments of great importance to the State. Pop. (1900) 4,208; (1904) 16,116.

Chanzy, shän-zē, **Antoine Eugène Alfred**, French general and politician: b. Nouart, Ardennes, 18 March 1823; d. Châlons-sur-Marne 4 Jan. 1883. After a course at the military school of Saint Cyr, he became sub-lieutenant of infantry in 1843, and was sent to Algeria. He subsequently served in Italy and Syria, but on becoming colonel he returned to Africa in 1868. On the outbreak of the war with Germany, in 1870, he was created a general of division, and after gaining the battles of Coulmiers and Patay, was put in command of the second army of the Loire. Here he fought heroically against the much stronger and more disciplined Germans, but finally had to retreat. He was elected to the National Assembly for the department of Ardennes, and during the Commune he narrowly escaped with his life. In 1873 he went to Algeria as governor-general, and in 1879 he stood for the presidency. In that year also he was sent to Russia as ambassador, a post which he held till 1881, when he became commander of the sixth army corps.

Chao-chow, chow'-chow', China, a city in the province of Kwang-tung, on the River Han, 195 miles northeast of Hong Kong. It is the centre of an important maritime division of the province. The channel leading to it is very shallow, so that ships of large burden can sail up only at high water. This city was included

in the Treaty of Tientsin (1858) as a port open to foreign trade, but the foreign trade is transacted at Swatow. Pop. (1900, estimated) 200,000.

Chaos, according to the signification of the word, the void which embraces all things. Hesiod mentions, as the original principles of all things, Chaos, Earth, and Eros (Love); other ancient poets made Chaos alone the primeval source from which everything is derived; others added to it Night, Erebus, and Tartarus; and others still represented Chaos as the parent of the Earth and Heaven; after the production of which Eros (Love) completed the creation. Modern writers commonly understand by chaos the unformed primeval matter from which the universe was made.

Chap-books, a species of cheap literature, in the form of small pamphlets, which preceded the popular periodicals of the present day and were so called because prepared expressly for sale by the chapmen, or pedlars, who hawked them from district to district. They were largely productions of the provincial presses. The writers are mostly unknown, but one of the authors of Scottish chap-books was Dougal Graham (1724-79), bellman of Glasgow. Their matter was of the most varied character, and some of them were decidedly coarse and vulgar.

Chapala, chä-pä'la, Mexico, a lake on the high plateau of Jalisco, surrounded by steep, bare mountains. It has an estimated area of 1,300 square miles, contains many islands, and is traversed by the Rio Grande de Santiago.

Chapeaux, shä-pō (Fr. "hats"), a name applied to the partisans of France in Sweden in the 18th century, while those of Russia were called bonnets (caps). Having instigated war against Russia in 1741, and again in 1756, the calamities thus inflicted upon Sweden impaired the popularity of the *chapeaux*. Succeeding in 1769 in regaining their former position, the party was soon extinguished altogether by the advent of Gustavus III. and his reforms. The same names were also formerly applied in the French academy, the *chapeaux* constituting the party supported by the philosophers and the public, and the bonnets that upheld by the clergy and the court.

Chaparral-cock, chäp-a-räl'-kök, one of the English names of a species of ground-cuckoo (*Geococcyx californianus*), so called from the chaparral, or sornb, which it inhabits. A remarkable bird which Coues aptly describes as a "cuckoo compounded of a chicken and a magpie," having a length of about two feet, of which a half is tail, very short wings, powerful legs, and feet of the cuckoo type, a rather long bill and crested head. The colors are changing and varied bronzes with brown and white markings. The chaparral-cock inhabits northern Mexico and southwestern United States, while a second related species is confined to Mexico. When pursued it seldom flies, but runs with great speed with upraised wings. Like other American cuckoos it builds a flimsy nest of twigs, in which six or more white eggs are laid at intervals. In feeding both animal and vegetable matter are partaken of. They are sometimes domesticated and trained to catch mice and other house pests. Other names applied to

CHAPEL — CHAPLEAU

this bird are road-runner, ground-cuckoo, paisano, and snake-killer, each of which suggests one of the peculiarities of the bird. See CUCKOO.

Chapel (French *chapelle*, Latin *capella*), a name for religious edifices of various kinds, especially for such as hold a subordinate position. In England and Scotland there are several kinds of chapels—parochial chapels, subordinate to, but distinct from, the mother church; chapels of ease, built for the accommodation of the inhabitants in large parishes; university chapels, and private chapels, whose names explain their uses. The term is also applied to small buildings attached to cathedrals, and separately dedicated. In England nonconformist places of worship are commonly called chapels in distinction from those of the Established faith to which the term church is applied. In the early history of Massachusetts Bay Colony the Congregational body was the established church, and the first Episcopal church in Boston was consequently termed a chapel, retaining that name, "King's Chapel," to the present time. (See KING'S CHAPEL.) The word chapel is also applied to an association of union workmen in a printing-office for the purpose of promoting and enforcing order among themselves.

Chapelain, Jean, zhōn shǎp lǎn, French poet, one of the earliest members of the French academy: b. Paris 4 Dec. 1595; d. there 22 Feb. 1674. Having gained a high literary reputation, more by ingratiating himself with Richelieu and other influential persons than by his intrinsic merits, he conceived the project of writing an epic, 'La pucelle,' which proved a total failure, although he spent over 20 years upon it. The first 12 cantos appeared in 1656; and to so high a pitch had public expectation been wrought, that, notwithstanding the adverse criticism of Boileau and Voiture, six editions came forth within the following 18 months. Eight new parts appeared in 1757, and the concluding four parts which never were printed, are in manuscript in the imperial library of Paris. Richelieu, to whom he dedicated a poem and whom he assisted in concocting literary works, conferred a pension on him; he presided over the organization of the French academy, took a conspicuous part in the early labors of that body, sat as academical critic upon Corneille's 'Cid,' and possessed during nearly 40 years a literary prestige, which was broken by his 'Pucelle,' although he remained in favor with the court.

Chapelle, Placide Louis, American Roman Catholic prelate: b. in the diocese of Mende, France, 28 Aug. 1842; d. New Orleans, La., 9 Aug. 1905; He studied at the College of Enghien, Belgium, but in 1858 came to the United States and after completing his theological course at the Baltimore Seminary, was ordained priest by Archbishop Spalding in June, 1865, the missions of Montgomery County, Maryland, being the scene of his first ministerial duties. In 1871 he was made assistant at St. John's Church and afterwards rector of St. Joseph's Church, Baltimore, whence he was appointed to the rectorship of St. Matthew's Church, Washington. He became vice-president of the Bureau of Catholic Indian Missions and helped to found the Catholic University. On 21

Aug. 1891, he was made coadjutor to the Bishop of Santa Fé; in 1893 was elevated to the titular archiepiscopal see of Sebaste and in less than a year succeeded Archbishop Salpointe in the see of Santa Fé. However, he was soon transferred to the diocese of New Orleans, assuming his new charge on 10 Feb. 1898. In September 1898 Pope Leo XIII. appointed him apostolic delegate to Cuba and Porto Rico, in 1899 the Philippines being added to his care. Subsequently he spent three months in the discharge of his official duties in his country's new possessions. Within eight months he consecrated four bishops for Cuba, and three more for sees in other places. The diocese now (1905) comprises 247 priests; 199 churches; 2 seminaries; 90 parochial schools; 13 orphanages and 3 hospitals, besides other benevolent and educational institutions and boasts a Catholic population of about 450,000.

Chaperon, shǎp'ë-rōn, a cap or hood. Such a covering is worn by Knights of the Garter, and was at one time in general use, but was latterly appropriated to doctors and licentiates in colleges. A person who acts as a guide and protector to a lady at public places is called a chaperon, probably from this particular piece of dress having been used on such occasions. The name was also applied to devices which were placed on the heads of horses at pompous funerals.

Cha'pin, Edwin Hubbell, American clergyman: b. Union Village, N. Y., 29 Dec. 1814; d. New York 27 Dec. 1880. In 1837 he was ordained to the Universalist ministry, was a pastor at Richmond, Va., Charlestown and Boston, Mass., 1838-48, and then accepted a call to the Fourth Universalist Church in New York, a connection he retained until his death. His collected sermons and addresses are: 'Discourses on the Beatitudes' (1855); 'Select Sermons' (1860); 'Living Words' (1861); 'Lessons of Faith and Life' (1876); 'God's Requirements' (1881); 'The Church of the Living God, and Other Sermons' (1881). See 'Life,' by Ellis (1882).

Chap'lain, a clergyman not having a parish or similar charge, but connected with a court, the household of a nobleman, an army, a prison, a ship, or the like. Chaplains in the United States army rank as captains of infantry; in the navy they have the rank of lieutenant commander, and captain, according to length of their service.

Chaplain of the Fleet, The, a novel by Walter Besant and James Rice, published in 1881. It gives a detailed account of the famous Liberties or Rules of the old Fleet prison in London, and of the Fleet marriages of the 18th century. These "Rules" were houses in certain streets near the Fleet Market, where prisoners for debt were allowed to live, outside the prison, on payment of fees. This novel is considered one of the best of those written under the firm-name of Besant & Rice.

Chapleau, shā-plō, SIR Joseph Adolphe, Canadian statesman: b. Saint Therese de Blainville, Quebec, 9 Nov. 1840; d. Montreal 13 June 1898. He studied law and distinguished himself at the bar. He was chosen leader of the Quebec Conservatives and formed a cabinet in 1879, re-

CHAPLIN — CHAPMAN

remaining premier of Quebec till appointed secretary of state for the Dominion in 1883. He was lieutenant-governor of Quebec in 1893-8.

Chaplin, shäp-län, Charles Joshua, French portrait painter: b. Les Andelys 6 June 1825; d. Paris 30 Jan. 1891. He was of English parentage, but was naturalized as a French citizen. Under Napoleon III. he was engaged in decorating the Tuileries and the Elysée, and he also painted many ceilings and wall decorations in Parisian public and private buildings as well as various portraits, mainly those of women.

Chap'lin, Heman White, American lawyer and short-story writer: b. Rhode Island 1847. His 'Five Hundred Dollars and Other Stories of New England Life' ranks with the best works of its kind.

Chaplin, Jeremiah, American historical writer: b. Danvers, Mass., 1813; d. New Utrecht, N. Y., 5 March 1886. He was author of: 'Life of Charles Sumner'; 'Life of Franklin'; 'Riches of Bunyan'; 'Life of Galen'; and 'Life of Henry Dunster, First President of Harvard College' (1872), a work of much historical value.

Chap'man, Alvan Wentworth, American botanist: b. Southampton, Mass., 28 Sept. 1809; d. 6 April 1899. He graduated at Amherst 1830, studied medicine in Georgia and Florida, and in 1846 settled in Appalachicola, where he was collector of internal revenue 1865-6, and collector of customs 1866-9. He attained a high rank as a botanist, and the genus *Chapmannia* was named in his honor. He wrote: 'Flora of the Southern United States, Arranged According to the Natural System; the Ferns by D. C. Eaton' (1860, 2 ed. enlarged, 1883).

Chapman, Frank Michler, American naturalist: b. Englewood, N. J., 12 June 1864. Since 1887 he has been assistant curator in the department of vertebrate zoology in the American Museum of Natural History, New York. He is editor of 'Bird-Lore' and associate editor of 'The Auk.' Besides many papers in scientific journals, etc., he has published: 'Hand-book of Birds of Eastern North America' (1895); 'Bird-Life, a Guide to the Study of Our Common Birds' (1897); 'Bird Studies with a Camera' (1900).

Chapman, George, English poet, the earliest and perhaps the best translator of Homer; b. Hitchin Hill, Hertfordshire, 1557; d. London 12 May 1634. He was educated at Oxford, and in 1576 proceeded to London, where he made the friendship of Shakespeare, Spenser, Marlowe, and other distinguished writers of the time. As to his personal history little is known, but he is supposed to have held some post in connection with the court. The first of his works, so far as known, was the 'Shadow of Night,' a poem published in 1594. His translation of the 'Iliad,' in rhyming lines of 14 syllables each, was published in three separate portions, in 1598, 1600, and 1603. It has been highly commended by such poets as Pope, Keats, and Coleridge, as also by Lamb. Keats' sonnet 'On First Looking Into Chapman's Homer' ("Then felt I like some watcher of the skies," etc.) is well known. In 1614 appeared his translation of the 'Odyssey' in the same metre as the 'Iliad,' followed in the

same year by that of the 'Battle of the Frogs and Mice' and the Homeric hymns. He also translated Hesiod's 'Works and Days' and portions of various classic poets. He wrote numerous plays, almost all now forgotten, though containing some fine passages. The earliest of these was 'The Blind Beggar of Alexandria,' a comedy, 1598. He was associated with Jonson and Marston in writing the comedy of 'Eastward Ho!' which from its satirical reflections on the Scotch is said to have nearly brought severe punishment on the authors. Among his tragedies are 'Bussy d'Ambois', 'Cæsar and Pompey', 'Revenge for Honor', and two dramas on the life of Marshal Biron, which Swinburne characterizes as "a storehouse of lofty thought and splendid verse, with scarcely a flash or sparkle of dramatic action." An edition of his works was published (1873-4). See Swinburne, 'George Chapman: a Critical Essay' (1875); Matthew Arnold, 'On Translating Homer.'

Chapman, Henry Cadwalader, American physician: b. Philadelphia 17 Aug. 1845. He graduated at the University of Pennsylvania in 1863, from the medical department in 1867, and after three years study in Europe settled in practice in Philadelphia. He has lectured on 'Anatomy and Physiology' in the University of Pennsylvania; on 'Physiology of the Nervous System' in Jefferson Medical College, and is curator of the Philadelphia Academy of Sciences. He has published: 'Evolution of Life' (1878); 'History of the Discovery of the Circulation of the Blood' (1884); 'Medical Jurisprudence and Toxicology' (3 ed. 1903).

Chapman, J. Wilbur, American clergyman: b. Richmond, Ind., 17 June 1859. He graduated at Lake Forest University, Illinois, in 1879, and at Lane Theological Seminary in 1882. After pastoral work in Albany and Philadelphia, and evangelistic work in all parts of the country, he became pastor of the Fourth Presbyterian Church in New York. He is a prolific writer of Sunday-school and Christian Endeavor literature, of which the following are among his most recent titles: 'The Lost Crown' (1898); 'Spiritual Life of the Sunday-school' (1899); 'The Surrendered Life' (1899); 'From Life to Life' (1900); 'Life and Work of D. L. Moody' (1900); 'Revivals and Missions' (1900); 'Day by Day' (1901); 'Man Who Said He Would' (1902).

Chapman, John Gadsby, American artist: b. Alexandria, Va., 1808; d. 28 Nov. 1889. Early indicating his taste for design, he was enabled by the liberality of a friend to visit Rome, and to study and practise his art there for several years. After his return to the United States, he removed to the city of New York, where, by his rare union of mechanical ingenuity with artistic taste, he rapidly obtained ample employment. He executed many original designs for the illustration of works of taste or fancy, and also painted the 'Baptism of Pocohontas' for one of the panels in the rotunda at Washington. In 1848 he returned to Rome.

CHAPMAN — CHAPTAL

Chapman, John Jay, American lawyer and essayist: b. New York 1862. He was graduated from Harvard in 1884, was admitted to the New York bar and has been in active practice there since. His essays and speeches have attracted considerable attention on account of their striking individuality and original point of view. His published volumes include: 'Emerson, and Other Essays' (1898); 'Causes and Consequences' (1898); 'Practical Agitation' (1900).

Chapman, Maria Weston, American reformer: b. Weymouth, Mass., 1806; d. there 1885. She was a daughter of Warren Weston, and received her education in her native place and also in England. She married in 1830; became an active opponent of slavery in 1834; and after the death of her husband in 1842, went to Paris, France, and assisted the anti-slavery cause with her pen. She returned to America in 1856. She edited the autobiography of her friend, Harriet Martineau (1877), and wrote: 'Songs of the Free' (1836); 'Right and Wrong in Boston; Report of the Boston Female Anti-Slavery Society' (1836); 'Right and Wrong in Massachusetts' (1840).

Chapone, sha-pōn', Hester, English story-writer and poet: b. Northamptonshire 27 Oct. 1727; d. 1801. She wrote: 'Ode to Peace'; 'Fidelia,' a story; 'Miscellanies in Prose and Verse'; and other works.

Chapoo, chā-poo', China, a seaport in the province of Chekiang, on the north side of a large bay, 35 miles north from Ningpo. It is fortified and garrisoned by Manchu troops, carries on a very considerable trade, and was once the only Chinese port which was permitted to trade with Japan.

Clappe, Claude, klōd shāp, French engineer and mechanic: b. Rouen 1760; d. Brulon 23 Jan. 1805. Having invented an ingenious system of signals to communicate at a distance with his friends, he presented it to the French legislative assembly in 1792. It was successfully tried between Paris and Lille, on a length of 48 leagues, and was adopted by the government. Clappe established several lines in France, and the one running north was first put in motion to announce the recapture of the town of Condé from the Prussians. The inventor was at once rewarded by the convention, which, by a decree, appointed him *ingénieur télégraphe*. The lines were extended all over France, and the system was also adopted, with some alterations, through Germany and England. The attacks to which he was subjected, by persons jealous of his invention, preyed so much upon his mind that he committed suicide.

Chappe d'Auteroche, dō-tē-rōsh, Jean, French astronomer: b. Mauriac, Auvergne, 2 March 1722; d. San Lucas, Cal., 1 Aug. 1769. He was a priest, but giving his whole attention to astronomy, became one of the assistants of Cassini in delineating the general map of France, and edited the astronomical tables of Halley. In 1760 he was designated by the academy to make an observation of the transit of Venus over the sun's disk, which Halley announced would happen 6 June 1761. He consequently set out for Tobolsk, in Siberia, which was pointed out as the most favorable point of

observation. His mission was successfully accomplished; and returning to France at the end of two years, he published in 1768 his 'Voyage en Sibérie.' The following year he sailed for California to observe another transit of Venus, which was to take place June 3. He was equally successful on this occasion, but died soon afterward. The results of his last expedition were published by Cassini, under the title of 'Voyage de la Californie.'

Chap'pell, William, English author: b. 20 Nov. 1809; d. London 20 Aug. 1888. For the most of his life he lived in London, where he was for some years a member of a great music publishing house. His first work of importance was 'A Collection of National English Airs, Consisting of Ancient Song, Ballad, and Dance Tunes' (1838-40). He took a principal part in the foundation in 1840 of the Musical Antiquarian Society and the Percy Society, and published the first volume of a 'History of Music' in 1874.

Chapple, Joseph Mitchell, American journalist: b. La Porte City, Ia., 18 July 1867. He studied at Cornell College, Iowa, and was engaged in journalism in Dakota, Ashland, Wis., and Chicago until 1897, when he became editor and publisher of 'The Bostonian,' afterward changed to 'The National Magazine,' Boston, Mass. He has written two novels: 'The Minor Chord' (1895; new ed. 1898); and 'Boss Burt, Politician' (1896).

Chap'ra. See CHUPRA.

Chaptal, Jean Antoine Claude, zhōn äntwän klōd shāp-tāl, COUNT DECHANTELOUP, French chemist and statesman: b. Nogaret, Lozère, 4 June 1756; d. Paris 30 July 1832. During his medical studies and practice he devoted much research to the science of chemistry, in which he soon became eminent, and was appointed professor at Montpellier, where he taught successfully the doctrines of Black, Lavoisier, and Cavendish. He established chemical works near Montpellier, being the first attempted of the kind, and by which he was soon enabled to produce various chemicals hitherto imported, such as the mineral acids, alum, soda, and salts of lead. The authorities of Languedoc heaped honors on him; the Spanish government offered him a pension of 56,000 francs to go to Spain, and according to his biographer, Washington wrote three times to Chaptal, inviting him to America. After the outbreak of the French revolution he published a political pamphlet, entitled 'Dialogue Between a Montagnard and a Girondist,' and was arrested, but through the intercession of friends was liberated. The Committee of Public Safety placed him in charge of the powder mills of Grenelle, which produced, under his management, 3,500 pounds of gunpowder daily. Once more returning to Montpellier, he was elected member of the institute, and devoted himself to science, till Bonaparte summoned him to the council of state, where he had the supervision of national education. When Lucien Bonaparte resigned the portfolio of the interior, Chaptal took his place as minister, and for four years performed the duties of the department with much administrative ability. He founded the conservatory, school of arts,

CHAPTER — CHAPULTEPEC

and society for encouragement of industry, introduced the modern French system of weights and measures, established a model farm and a system of distribution of agricultural seeds, reorganized the prisons and hospitals, extended the network of highways over the face of the country, and organized the carrying out of the plans of extension of the Louvre and *rues de Rivoli* and *Castiglione*, since completed by Napoleon III. On Napoleon's return from Elba, the count was appointed director-general of commerce and manufactures. Louis XVIII. struck him from the list of peers, but left him on the roll of the academy. His works are all on chemical subjects, and may yet be consulted with advantage, especially his 'Treatise on Chemistry Applied to the Arts.'

Chap'ter (Latin *caput*, head), one of the chief divisions of a book. As the rules and statutes of ecclesiastical establishments were arranged in chapters, so also the assembly of the members of a religious order, and of canons, was called a chapter, because some or all of the chapters containing the rules were read there; and the place where they assembled, as well as the reproof administered to a delinquent member, by reading the rules of the chapter transgressed, had the same name. The orders of knights, which originally had much of the ecclesiastical constitution, used this expression for the meetings of their members, and even some corporations of mechanics or tradesmen call their assemblies chapters. In England, as elsewhere, the deans and chapters had the right to choose the bishop, but Henry VIII. assumed this right as a prerogative of the crown.

Chap'ter-house, a building attached to a cathedral, collegiate church, or church belonging to a religious house in which the chapter meets for the transaction of business. Chapter-houses are of different forms, being sometimes regular polygons of four, eight or ten sides, and in other cases circles or parallelograms; and their architecture is often noteworthy. Sometimes they were the burying-places of clerical dignitaries. Among the most notable of English chapter-houses are those at Lincoln cathedral (which is decagonal, with a central column), Salisbury, Wells, Southwell, and York, the two last named excelling all others in Great Britain in the beauty and richness of their carven stonework. There is a chapter-house at Bristol, of the Norman period, in shape a parallelogram, much enriched with arched and various kinds of Norman ornament. The chapter-houses at Gloucester and Canterbury are likewise parallelograms, but of the Third Pointed or Perpendicular period.

Chapuis, shä-pwē, **Auguste Paul Jean Baptiste**, French musician: b. Dampierre-sur-Saône 20 April 1862. Since 1895 he has been inspector-general of musical instruction in the Paris schools. He has composed 'Tancred', a lyric drama, and much successful church music.

Chapultepec, chä-pool-tě-pěk' ("Grasshopper Hill"), **Battle of**. This, the last considerable engagement of the Mexican war, and which was followed by the immediate occupation of the City of Mexico, was fought 12-13

Sept. 1847. Chapultepec is an isolated rocky mound 150 feet high, two miles southwest of the southwestern or Belen gate of the city, and guarding a main road into it; sharply precipitous on the northern, eastern, and part of the southern sides, but on the west and southwest sloping gradually to level marshy ground partly covered with a cypress grove. Here Montezuma and his predecessors had their pleasure grounds, and Chapultepec was their country-seat. A fortified castle was started here by the viceroy Galvez in 1785, but left unfinished; from 1822 it was used as a military academy, in 1847 having some 40 students, who fought heroically in the battle. It was guarded by strong batteries, and its approaches were protected by walls (an aqueduct on the north) which shielded other batteries; through the marshy fields in front of these were irrigating ditches, some large and deep, with high banks and sticky bottoms, very serious obstacles to troops and artillery. The one military defect of the castle for modern warfare was the limited force that could effectively use arms within it; the garrison of 800, commanded by Gen. D. Nicholas Bravo, was as large as could well operate there. Along its approaches were some 4,000 to 4,500 more troops, while Scott had 7,500; but Santa Anna dared not strip the other entrances to the city. By the battle of Molinos del Rey (q.v.) on the 8th Scott had carried a set of long stone buildings southwest of Chapultepec and, though under its guns, forming some protection for hostile artillery. On the 12th Captain Huger planted heavy batteries here and at three other places, to range the south and west of the hill, the only accessible portions, on which an assault had been determined; and their fire gradually silenced that from Chapultepec, breached the defenses, and caused much loss. About 8 A.M. on the 13th Scott launched two assaulting columns: Pillow on the west, from Molinos del Rey through the cypress grove, supported by Worth; Quitman against the south, from the heights of Tacubaya, where Scott had his headquarters, supported by Persifer F. Smith's brigade. Preceded by the pioneer companies with ladders, axes, picks, and crowbars, and under a plunging fire, they surmounted all obstacles, cleared the approaches, broke through the walls, climbed the heights, entered the castle gates, and having cut off retreat by the northwestern road to Mexico, captured the entire garrison. The approaches and castle had been mined, but the defenders waited too long before exploding the mines, and failed. The next day the American army overcame all remaining resistance and entered the capital. Their loss in these three days was 863 killed and wounded, including Col. T. B. Ransom killed, Pillow and Shields wounded. The Mexican loss was unknown, but certainly as heavy, and included several gallant and brilliant officers; and 823 prisoners were taken, including three generals, one the commandant of the academy. Among the American officers prominently engaged were a remarkable number afterward distinguished in military and civil life: Robert E. Lee, Joseph E. Johnston, James Longstreet, "Stonewall" Jackson, David E. Twiggs, Gideon J. Pillow, D. H. Hill, J. B.

CHAR — CHARCOT

Magruder, Barnard E. Bee, P. G. T. Beauregard, Geo. E. Pickett, Raphael Semmes; George B. McClellan, Silas Casey, E. V. Sumner, Jesse L. Reno, James Shields, I. I. Stevens, Z. B. Tower, William S. Harney; Thomas H. Seymour, John W. Geary, Mayne Reid. Franklin Pierce had been severely wounded at Molinos del Rey. See C. M. Wilcox, 'History of the Mexican War' (1892).

Char, här, Friedrich Ernst (FRITZ), German composer: b. Cleve-on-Rhein 3 May 1865. He is a noted opera conductor, and wrote the celebrated romantic opera, 'The Rogue of Bergen' (Der Schelm von Bergen), besides sonatas and cantatas.

Char, chär, a genus of fishes (*Salvelinus*) of the family *Salmonidæ*. They were formerly classified in the same genus as the trout (*Salmo*), from which they are, however, differentiated by color and by the shape of the vomer. There are several varieties of this fish, all having intense and beautiful colors; length from 10 to 15 inches; weight sometimes as high as two pounds, but generally ranging under one pound. All kinds are held in esteem for the table. They are found plentifully in the deeper lakes of England, Wales, Ireland, and more rarely in Scotland, also in the Lake of Constance and Lake Geneva. The best known American variety is the brook-trout, *S. fontinalis*; there is also a variety found in Maine, known as the Rangeley Lake trout, which is very similar to the European char.

Chara, kā'ra, in botany, a genus of plants, the typical one of the order *Characeæ* (q.v.). The species are found in ponds. In palæontology, the nucules, known under the name of *Gyrogonites*, are found for the first time in the fresh-water beds of the Jurassic (Oölitic) formations. They are the minute spiral seed-vessels or sporangia of these plants.

Characeæ, kā-rā'se-ē, an order of cryptogamous plants, division *Algæ*, composed of an axis consisting of parallel tubes, from which the branches are given off in whorls. The axes are either transparent or incrustated with carbonate of lime. The plants inhabit stagnant water, both fresh and salt, beneath which they are always submersed. They are found in almost every part of the world, but are most common in the temperate zone. The fetid odor which many species emit renders the surrounding locality very unhealthy.

Charade, sha-rād', a syllabic enigma, that is, an enigma the subject of which is a name or a word that is proposed for discovery from an enigmatical description of its several syllables, taken separately, as so many individual words. A charade may be called complete if the different enigmas which it contains are brought into a proper relation to each other, and, as a whole, unite in an epigrammatic point. The French excel in this species of literary amusement.

Acting Charades, a kind of entertainment made up of pantomime and dialogue, and improvised by the members of an evening party. The syllables and complete word are meant to be suggested by the various divisions of the piece.

Charadriidæ, kā-ra-drī'i-dē, the plovers, a family of birds of the order *Limicolæ*, which along with several equivalent groups is sometimes considered as constituting a more extended order, *Charadriiformes*. Even as limited by American ornithologists the family is a large and important one, embracing many genera and species from all parts of the world. They have long, slender legs, with the toes united by a small membrane, the hinder one very small and elevated, or wanting; the tarsus reticulate; the neck short and thick; body stout; plumage compact, with 12 short tail-feathers and very long primary wing-quills; the beak is short and shaped much like a pigeon's. By European ornithologists the limits of the family are extended to include various related groups, especially the snipes (*Scolopacidæ*), which then constitute sub-families. See KILLDEER; LAPWING; PLOVER; etc.

Charadrius, ka-rād'rī-ūs, the genus to which the plover belongs, forming the type of the family *Charadriidæ*, which includes also the lapwings, dotterels, oyster-catchers, turnstones, sanderlings, etc. (qq.v.).

Charcoal, an impure variety of carbon, prepared from vegetable substances or bones. Wood charcoal consists of wood burned with but little access of air. Billets of wood are built into a heap, which is covered with earth or sand. The heap is fired at openings left near the bottom of the pile, and the gases escape at small openings above. For making fine charcoal, such as that of willow, used in the manufacture of gunpowder, the wood is burned in iron cylinders, or rather retorts, in which a process of destructive distillation removes the volatile hydrocarbons, pyroligneous acid, etc. By this more perfect means the process is accurately regulated. Charcoal is used in the arts as a fuel; as a polishing powder; a table on which pieces of metal are secured in position to be soldered by the blowpipe; a filter; a defecator and decolorizer of solutions and water; an absorbent of gases and aqueous vapors; a non-conducting packing in ice-houses, safes, and refrigerators; an ingredient in gunpowder and fireworks; and in the galvanic battery and the electric light.

Animal charcoal, used largely in sugar-refining and as a disinfectant and filtering medium, is prepared by calcining bones in closed vessels. These are either retorts, similar to those in which coal is distilled for the production of illuminating-gas, or they are earthenware pots, piled up in kilns and fired. Charges of 50 pounds of bones to a pot will require 16 hours of firing. The bones are then ground between fluted rollers, the dust removed, and the granulated material used for charging the filters of the sugar-refiner. The material is used for removing color, feculences, and fermenting ingredients from the syrup.

In medicine charcoal is sparingly used, but is of service in gastric indigestion in which there is much evolution of gas. Charcoal takes up the gas and therefore prevents distention and pain. It has no curative qualities and is solely alleviative.

Charcot, Jean Martin, zhōn mār tān shär-kō, French physician: b. Paris 29 Nov. 1825; d. 16 Aug. 1893. His specialty was in the treat-

CHARD — CHARES

ment of nervous and mental diseases, and he performed many curious and successful experiments in hypnotism and mental suggestion, in the Salpetriere, where he founded a clinic for the treatment of nervous diseases in 1880. He published several works treating of these subjects.

Chard, the leaves of artichoke (*Cynara scolymus*) covered with straw in order to blanch them and make them less bitter. Beet chards are the leaf-stalks and midribs of a variety of white beet (*Beta cicla*), in which these parts are greatly developed, dressed for the table.

Chardin, shär-dän, SIR John, French Oriental traveler: b. Paris 26 Nov. 1643; d. London 26 Jan. 1713. Before he had reached his 22d year his father, a jeweler, sent him to the East Indies in order to buy diamonds. Chardin lived six years in Ispahan, where he was less engaged in mercantile business than in profound studies and scientific researches, making use of his connections at court for collecting the most authentic information of the political and military state of Persia. He collected the most valuable materials relating to antiquities and history. In 1670 he returned to France, but again left France for Persia, in 1671, taking with him a considerable quantity of precious stones artistically set, exquisitely worked jewelry, etc. He spent 10 years partly in Persia and partly in India. In 1681 he arrived in London, when he received the honor of knighthood. He published the first volume of his 'Travels into Persia and the East Indies,' in London, in 1686. The other volumes were about to follow, when he was appointed minister plenipotentiary of the king of England to the States-General of Holland, and agent of the English East India Company to the same. In 1711 two editions of his 'Travels' appeared. He soon after returned to England. The exactness and truth of his statements, and the extent of his knowledge, have been confirmed by all succeeding travelers, and have been serviceable to Gibbon, Helvetius, and Montesquieu. The best edition of Chardin's 'Travels' is that by Langlès, 1811, in 10 volumes.

Charente, shä-rönt, France, an inland department, formed chiefly out of the ancient province of Angoumois, and deriving its name from the river Charente, by which it is traversed; area, 1,487,447 acres; capital, Angoulême. It is in general uneven, with hills covered with chestnut-trees, sandy plains, meadows, etc. The principal rivers are the Charente, joined by the canal of Poitou with the Vienne, the Dronne, Tardoire, Bandiat, Touvre, and Né. The wines of the department are of inferior quality, and in little request for the table; but they yield the best brandy in Europe. The celebrated cognac brandy is made in the districts of Champagne, Cognac, Jarnac, Rouillac, and Aigre from a grape called the *folle blanche*, which yields a white wine. The red wines furnish an inferior brandy, without the bouquet that distinguishes the genuine cognac. The wine-growers themselves carry on the distillation, each estate being furnished with stills and the necessary apparatus. Excepting brandy and paper, the manufactures of the department are inconsiderable, consisting of sacking, cloth, cordage,

hats, corks, and earthenware. The paper made at Angoulême is said to be the best in France. The department is divided into the five arrondissements of Angoulême, Barbezieux, Cognac, Confolens, and Ruffec. Pop. (1896) 356,236.

Charente, a river in France, rising in the department of the Upper Vienne; flowing west, and emptying into the Bay of Biscay, about 10 miles below Rochefort, opposite the Isle of Oleron; length about 200 miles. It gives its name to two departments, Charente (q.v.) and Charente-inférieure (q.v.).

Charente-inférieure, äñ-fä-rē-ër, France, a maritime department on the west coast, bounded on the north by the department of the Vendée, and on the south by Gironde; area, 2,635 square miles. It comprises parts of the former provinces of Angoumois and Poitou. The principal rivers that traverse or bound the department are the Charente, Gironde, Sèvre, Boutonne, and Sèvre Niortaise — all of which are navigable, as well as the canal of Brouage, and that between Niort and Rochelle. The soil is fertile, and well cultivated; and a considerable portion planted with vines. The pastures are good and well stocked with cattle, horses, and sheep. Along the coast are extensive salt marshes. Salt and brandy are the only articles manufactured to any great extent; the oyster and sardine fisheries are also of importance. Capital, La Rochelle. Pop. 453,000.

Charenton - le - Pont, shä-rön-tôn-lè-pön, France, a town situated about a mile to the southeast of Paris, with which it is connected by rail and tramway, at the confluence of the Marne with the Seine. It has numerous mercantile and manufacturing establishments. The stone 10-arched bridge across the Marne used to be considered as the key to Paris on this side; hence the memorable attacks upon it both in the civil wars of France and in those with foreign enemies. At Petit-Charenton is the celebrated asylum for the insane of both sexes. From its connection with the asylum the town has given several significant popular phrases to the French language, equivalent to the use of Bedlam in English. A person of marked eccentricity is called a "Charenton boarder." Pop. 16,811.

Chares, kã'rëz, the name of two well-known Greeks. The Athenian Chares was the general through whose incapacity the Thracian colony was lost to Athens during the Social war in 358-356 B.C., and who exposed his country to the designs of Persia, by entering for mercenary purposes the service of the revolted satrap, Artabazus. Although recalled in disgrace, Chares was sent in 349 to the aid of Olynthus, and again he returned without having achieved anything. In 340 he commanded the army sent to Byzantium against Philip, again gave evidence of his incompetency, was replaced by Phocion, but once more invested with the supreme command. In 338 the fatal issue of the battle of Chæronea seems to have been mainly due to his ignorance. He was noted for his athletic figure, his profligacy, and his unscrupulous recklessness. Chares, the sculptor, a native of Lindus, Rhodes, flourished toward the close of the 3d century B.C. He was a pupil of Lysippus and the sculptor of the Colossus of Rhodes, one of the "seven wonders of the world," a representation of the Rhodian sun god erected in commemoration of the successful defense of

CHARGE — CHARITABLE TRUSTS

Rhodes against Demetrius Poliorcetes in 303 B.C. See **COLOSSUS**.

Charge, in heraldry, one of the bearings. This may be one of the ordinaries, as they are called, the straight line bearings, as fess or chevron or a much more elaborate figure, as the representation of an animal or the head of one. Sometimes the charge is imposed upon another charge.

In gunnery, charge signifies the quantity of powder used at one discharge of a gun.

In military tactics, charge is the rapid advance of infantry or cavalry against an enemy, with the object of breaking his lines by the momentum of the attack. Infantry generally advances to about 100 yards and fires, then gradually quickens the pace into the charge-step, and dashes at the enemy's lines. Cavalry charges in echelon or column against infantry, which is usually formed in squares to receive the charge.

Chargé d'Affaires, shār-zhā dāf-fār, a representative of a country at a less important foreign court, inferior to an ambassador, or a minister, to whom is intrusted all matters of diplomacy. The title is also given to the officer to whom the charge of an embassy is entrusted during the temporary absence of the ambassador or minister plenipotentiary.

Charge of the Light Brigade, The, a remarkable military movement at Balaclava, 13 Oct. 1854, made by 600 English soldiers. The Russians were advancing in great strength to cut off the Turkish force from the English. Lord Raglan sent an order to Lord Lucan to advance, and Lord Lucan, not understanding what was intended, applied to Captain Nolan, who brought the message, and Nolan replied: "There, my lord, is your enemy." Lucan then gave orders to Lord Cardigan to attack, and the 500 men rode forward into the jaws of death. In 20 minutes 12 officers were killed and 11 wounded; 147 men were killed and 110 wounded, and 325 horses were slain. The blunder must be shared by Lord Lucan, Gen. Airey, and Capt. Nolan. However, never victory was more glorious to the devoted men, than this useless charge. "It was magnificent, but it was not war." When Lord Cardigan rallied the scattered remnants, and said: "My men, some one has blundered," they replied: "Never mind, my lord, we are ready to charge again, if it is your lordship's command."

Charikar', Afghanistan, a town in the district of Kohistan, 36 miles north of Kabul. It has a trade in the coarse cotton cloths manufactured throughout the district, and in iron, and also a considerable transit trade to Turkestan and central Asia. Charikar is the place of residence of the governor of Kohistan; and duties are levied here on merchandise passing between it and Turkestan. Pop. 5,000

Charing (chār'ing) Cross, a triangular piece of roadway at Trafalgar Square, forming the titular centre of London, so named from a cross which stood until 1647 at the village of Charing in memory of Eleanor, wife of Edward I. When the queen's remains were brought in 1290 from Grantham to Westminster Abbey, the king accompanied the bier and erected at each stage where it rested a memorial cross. Of the 13 crosses raised, but two beside

that in London remain. The modern cross, erected in 1863, stands on about the same place as the older one, of which it is as nearly as possible a reproduction, its style being the decorated Gothic of Edward's time.

Chariot, a vehicle used in ancient times either for pleasure or in war. According to the Greeks, it was invented by Minerva; while Virgil ascribes the honor to Erichthonius, a mythical king of Athens, who is said to have appeared at the Panathenaic festival, founded by him, in a car drawn by four horses. The ancient chariot had only two wheels, which revolved upon the axle, as in modern carriages. The pole was fixed at its lower extremity to the axle, and at the other end was attached to the yoke, either by a pin or by ropes. The Greeks and Romans seem never to have used more than one pole, but the Lydians had carriages with two or three. In general the chariot was drawn by two horses. Such was the Roman *biga*, but we also read of a *triga*, or three-horse chariot, and a *quadriga*, or four-horse one. In ancient warfare chariots were of great importance; thus we read of the 900 iron chariots of Sisera, as giving him a great advantage against the Israelites. The Philistines in their war against Saul had 30,000 chariots. The sculptures of ancient Egypt show that chariots formed the strength of the Egyptian army. We have also numbers of sculptures which give a clear idea of the Assyrian chariots. These resembled the Egyptian in all essential features. In modern times the name chariot has been given to a kind of light traveling carriage now out of vogue.

Charitable Irish Society, Boston, Mass.; the oldest existing Irish organization in the United States. It was founded 17 March 1737, by a number of Irish Protestants, and has borne on its roll many distinguished people. Among its founders was the father of Gen. Henry Knox, of the Revolution. Gen. Knox, himself, was also a member of the society. It celebrated its centennial anniversary in 1837 with great eclat, among the guests on that occasion being Gov. Edward Everett, of Massachusetts; Mayor Samuel A. Eliot, of Boston; Hon. John P. Bigelow, secretary of state; Hon. Josiah Quincy, Robert Rantoul, Jr., and other prominent men. Andrew Jackson, president of the United States, during his visit to Boston, in 1833, received the society at the Tremont House, that city, and replied to an address from the organization. The society is in a flourishing condition, and is non-sectarian and non-political.

Charitable Trusts. A charitable trust is "a gift, to be applied consistently with existing laws, for the benefit of an indefinite number of persons, either by bringing their minds or their hearts under the influence of education or religion, by relieving their bodies from disease, suffering, or constraint, by assisting them to establish themselves in life, or by erecting and maintaining public buildings or works, or otherwise lessening the burdens of government; a gift to a general public use, which extends to the poor as well as the rich." The things necessary to raise a valid trust are sufficient words to create it, a definite subject, and an object. In charitable trusts the object is generally uncertain, because if described with definiteness it would cease to be a charity and would be governed by

CHARITES — CHARITIES

the ordinary rules of trusts. At one time it was held that charitable trusts were created by an act passed during the reign of Queen Elizabeth, and known as the statute of charitable uses, but it has been shown that these trusts existed long before that act was passed. Charitable trusts are recognized in all of the States of the Union, while a number of the States have never adopted the statute at all. Even where the statute is enforced, trusts while not within the letter, if within the spirit of the statute, are held to be good. Uncertainty of the object is one of the characteristics of a charitable trust, and it has led to what is known as the *cy près* doctrine, which is that the courts will interpret instruments creating charitable trusts so that if the exact object of the donor cannot be carried out the donation will be applied to something of a nature similar to that specified by the donor.

When a testator leaves property to his executors in such a manner that they are to be the sole judges of its use, and the executors die before the testator, it is doubtful whether the trust will come into existence, as the executors were the only persons who could designate for what the donation was to be applied. In some jurisdictions the rule is that if the property can be applied to other than charitable purposes it is too indefinite.

In cases in which the particular charitable purpose does not exhaust the whole fund, if from the instrument creating the fund, the intention appears that the entire amount is for charity, the surplus will be devoted to some other charity and will not form a resulting trust for the heir or next of kin. A gift may be made to a charity not in existence, and a gift to a specific charity will not fail for want of a trustee.

After the trust has come into existence, if the purpose for which the trust was created fails for any reason, it will be applied to some other purpose of a similar character, so as to fulfil as nearly as possible the purpose for which it was intended.

Charitable trusts are not subject to the rule against perpetuities, which is that property cannot be tied up for more than a life or lives in being and 21 years thereafter. If property left to a charitable trust is limited upon another estate not a charitable trust, and the first estate is in violation of the rule against perpetuities, the trust will not be sustained; but after the trust once comes into existence the rule against perpetuities is not applied to it. In the State of New York charitable trusts are governed by the same rules as any other trust.

By English law all bequests for charitable purposes, to be valid, must be strictly for the public benefit; that is to say, in favor of institutions for the advancement of learning, science, and art; for the support of the poor; or for other objects connected with the welfare of the public; and such bequests include those in favor of the Church or of other religious bodies sanctioned by the law. Bequests for superstitious uses are null and void. A body of commissioners (the charity commissioners), under whose superintendence such benevolent trusts are placed, was established under the Charitable Trusts Act of 1853. They have the power of

inquiring into the administration of all English public charities. See MORTMAIN.

Charites, *kā'rīt ěz*, the Greek name of the Graces (q.v.).

Charities, Public. Following in the footsteps of civilization there has come a development of charity, often slowly and haltingly, but ever persistently, until to-day the treatment of its dependent poor is accepted as evidence of the civilization of a community. A glance through history discloses not merely neglect of the defective mentally and physically, by savage and barbarous peoples, but an aggressively cruel policy to rid the community of the burden of their care. Crippled children were left to die and helpless old persons were put out of the way. In contrast to that condition we find in the dawn of the 20th century a settled conviction in all civilized communities that it is as much the duty of the State to care for its dependents as it is to conserve the educational interests of its children. But this change was wrought only by self-sacrificing devotion of charitably inclined students of sociology through centuries of unremitting labor. So slow, indeed, was the development of the practice of charity that it is well within the last hundred years that the care of the helpless was left to individuals or was treated by society at large as an unreasonable burden on the State. Even after the conviction became permanent that for its own protection, if for no higher reason, the State should assume the responsibility of caring for its helpless classes the conception of its duties were so vague and the method to be followed was so undefined, that the results were eminently unsatisfactory. Society regarded its dependents as being much on the same plane as its criminals and treated them much in the same way. Prisoners, dependent children, sick poor persons, the insane, the epileptics and the helpless aged were huddled together under one department of government and it was not infrequently the case that little or no discrimination was made in their care. General demoralization ensued and it became apparent that a remedy must be found if further progress was to be made in the development of the practice of charity. This remedy was found in segregation. It was clear that not only physical separation but governmental separation of the various classes was necessary. Custom and tradition were hard obstacles to overcome, but the adherents of segregation were not to be denied, and after a long and bitter and often disheartening struggle they won their first victory, in the segregation of criminals. A separate and independent department of government was established for their care, although society retained in a large degree its old habit of regarding its criminals and its dependents in much the same light. But an opening had been made for segregation and its adherents were quick to press their advantage. They next demanded and obtained the segregation of the insane and followed this up by the successful demand for the segregation of epileptics, idiots, dependent children, the sick poor, homeless men and women, and the helpless aged. The aim was not merely to assure to each of these classes distinct physical separation from the others, but to give to each a government of its own so that it could receive the undivided attention and care

CHARITIES

of persons competent to do the work entrusted to them and held directly responsible for that work. So beneficial did the experiment of segregation prove to be that the practice of charity made strides for good after it was adopted far out of all proportion to progress in previous years. Indeed the benefits from segregation are so marked and so convincing that the policy has been extended to different conditions in the same class. This is particularly noticeable in the modern treatment of consumptives, for whom special hospitals are being constructed and special diet prepared. And yet the subject has not been exhausted. It is susceptible of further development and closer application. There is a crying need for it in the care of helpless old persons, in the treatment of whom the causes of destitution and the moral character of the individual should always be considered. The demonstrated advantages of segregation may be summed up in the more intelligent attention that each class receives and in the promise that eventually the choice of persons entrusted with the care of dependents will be made with no other purpose in view than fitness for the position to be occupied. The greatest obstacle to the fulfilment of this promise is politics, but the time will come when the practice of charity will be above all politics, as by right and justice and humanity it should be. But in spite of segregation and in spite of all the other remarkable advances made in charitable work in the last half century, society, in a large part at least, persists in regarding the criminal and the pauper from the same view-points. Manifestly this is unfair and unjust. Poverty is not a crime, and the victims of poverty should not be classed with criminals, even in the public mind. The State has not always recognized this principle. On the contrary, its theory and its practice have been to force the poverty-stricken individual into association with the criminal. It is scarcely more than a quarter of a century ago that convicted criminals wearing the uniform of the penitentiary were employed as nurses in public hospitals. When the force of union labor had driven prisoners as laborers out of the public streets, out of the public parks, off public works, and from every other place where public moneys were expended for the improvement of the general community, prisoners wearing prison garb were retained as workmen in the public charitable institutions. At a time when it would have meant a riot to have placed prisoners to care for the trees in the parks, to clean the cobblestones in the streets, or even to look after the sewers, the sick poor man, the helpless imbecile, and the abandoned child were left in part to the care of convicts. This was done in the name of charity, but it was such a rank injustice to the individual, such a blot on the civilization of the community, that the long-growing and firmly founded conviction of earnest students of sociology rebelled against it and, by energetic insistence won, step by step, a victory over such conditions.

The first great move toward the separation of the dependent poor from criminals was made in the introduction of the trained nurse into the public hospitals. Although that was but little more than a quarter of a century ago, in America, it was potent in its influence, and appealed so strongly to the sense of justice of

all communities that to-day every hospital, public or private, has its corps of trained nurses; and the fact that once the place held by the trained nurse was held by a convict in prison garb, is regarded as a barbaric horror. With the elimination of the convict as a nurse in the public hospitals, the cause of progress and reform was encouraged to extend its efforts to the elimination of prison labor in all public charitable institutions. The battle was not an easy one, but the adherents of reform never wavered. They were confronted by old theories and old customs. Chief among these was that which held that prison labor should be utilized and that inasmuch as the institutions that took care of the sick and the poor had always been associated intimately with those that punished the prisoners, it was economy on the part of the State to utilize the labor of the prisoner in the care of the sick and the poor. Changes of government in public charitable institutions, brought about by changes in political domination, retarded the victory, because new men coming into office had to go over all the ground that had been gone over by their predecessors, and often when they were in a frame of mind to take the necessary step forward, they were replaced by some political change which forced a new man into government, and left him in a like position to that occupied by his predecessor at the beginning of his term of office. But the conviction of the justice of the cause had grown so firmly that it was prepared to overcome all obstacles. It was persistent and insistent. It knew that it was right and it would not acknowledge defeat. The final outcome was that prison labor at the end of the 19th century was practically eliminated from public charitable institutions. The sentiment of communities had forced the powers that had the appropriation of public moneys to increase the appropriations for public charitable institutions to the extent that honest, self-respecting, paid labor, could be employed to care for the sick and the poor in public institutions. With that victory gained, it is not probable that there will ever be a relapse into the practice of using prison labor in any degree in public charitable institutions. The divorce between the prisoner and the pauper to-day is complete in almost every civilized community. Justice and humanity and charity will compel this divorce to stand.

Public sentiment has gone even further than the separation of prisoner and pauper. It has gone deep into the study of the condition of children, looking always to the best chance to develop a dependent child, or a criminal child, into a good citizen. It has recognized that environment is a powerful factor in the development of character, and one of its chief endeavors has been to disassociate the plastic mind of childhood from impressions that would tend to retard reform in a child already started on the downward path, as well as to protect a child not contaminated by vicious surroundings from influences tending to contaminate it. The crowning work of this endeavor has been the establishment of children's courts, wherein the cases of children charged with crime are tried, free from even the sight of adult criminals. Further than this, it has been brought about that the adult pauper and the dependent child

CHARITIES

are segregated through the agency of established bureaus for the care of dependent children, protecting them from contact with adult paupers.

The theory and practice of modern charity does not stop with the treatment of conditions as they are found. It has gone deep into the subject and has found that in past ages, too much attention has been given to effect and too little to cause. It recognizes that if a poor man falls ill, it is economy on the part of the State to make him well in as short a time as possible, not only that he may not be a burden in the hospital, but that he may return to the support of his wife and family. To this end, it has built more and better hospitals for his care. It has looked into the causes that led to his sickness, and having found these in wretched dwellings and unsanitary surroundings, it has, through the agency of tenement house reform, sought to bring about conditions of living that, in a great measure, will prevent sickness. It is recognized that it is economy on the part of the State, to take a homeless and friendless child and give it a good physical foundation for a healthy mind in a healthy body. It is recognized that the morally imperfect child should be taken in hand as soon as possible and trained under moral influences, so that the imperfection may be removed. To bring this about, sociology has not been satisfied with the mere treatment of the child as it was found, but it has studied the origin of the child and has sought to remove the causes that produced such results, in order that other similar results should not have to be treated by the State. Out of this theory and practice, have grown day nurseries, kindergartens, manual training schools, and numerous other similar institutions, supported by public or private charity, all striving to remove evil influences and replace them with good influences. Not only do the day nurseries take care of children while their mothers work, but they teach the mothers how to care for the children physically and morally. Kindergartens give the first rudiments of education, and manual training schools lay the foundation for useful occupations. These institutions, by suggestion and encouragement, increase the sense of responsibility on the part of parents, and thus render a priceless service to the community.

In the broadest sense, all men may be said to need help. Interchange of service is a necessity in the economic structure. Charity is not confined to the mere giving of alms. At some time or other in his experience, every man has felt the need of a helping hand. He may not have needed money, but he has needed advice, or kindness, or sympathy. At some time or other, everyone has felt the need of something from another, and the filling of that need is charity. It may be sometimes indefinable, but it exists, and the realization of its existence has caused the development of that vast system of help in civilized countries which is designated by the general term charities. The impulse to relieve distress is almost universal, but how to give and when to give is a problem that must be seriously considered, for it is not infrequently the case that giving does harm. The first appeal for alms is always the most difficult. No person ever asked for alms with-

out, in the first instance, feeling a loss of self-respect. The second asking is easier than the first, and the third than the second, and so on until finally a beggar, without self-respect, is made. It were better in many instances to have refused the first appeal, and thus thrown the applicant back upon his own resources to meet the emergency that confronted him. It were better in almost all instances to refuse the appeal unless some satisfactory investigation has been made as to the real condition of the applicant. This is particularly true in communities where institutions are provided for the immediate relief of the needy. In most of the great municipalities, there is no need for any one to go without food or shelter, for food and shelter are provided by the State, and are to be had for the asking. It is a recognized truth that the poorest people are the most charitable. This is due to two causes. The first is, that a poor person understands from his own experience what another poor person suffers. The second is that by the force of circumstances poor people live in close juxtaposition, and are subject to the appeals of their neighbors. Out of this comes neighborly charity, which is probably the best form of charity, because there is less chance of imposition, on the one hand, and of unnecessary help, on the other. It is less mistaken than any other form of charity. It finds expression in innumerable ways. The tenement-dweller knows of the want of his neighbor, and gives him a share of his own necessities. The physician recognizes the impecuniosity of his patient and gives his services free. The retail dealer in his little shop knows the financial condition of his customers and extends credit. The lawyer sometimes makes no charge for his services. The landlord is not insistent on the immediate payment of his rent. The employer often advances wages before the work is done. Neighborly charity takes a hundred other forms and rarely makes a mistake, because the one who lends the helping hand knows the recipient is worthy of it. It is sound and sensible and is the most beautiful form of all charity. But there comes a time when, by demonstrated unworthiness, or continued helplessness, an object of charity breaks the patience or exhausts the resources of the neighborhood, and has to reach out for aid from others. Then it becomes necessary for some organized charity to exert itself. The Church is a powerful organization in extending charity. Churches of all denominations have always looked after their poor and helpless; and the Church is really the first organized charity. But the question arises as to whether, after all, it is not the duty of the community as a whole, rather than that of the Church, to care for the poor. It is well for the Church to do all that it can, but the fundamental responsibility for the care of the poor rests upon the community. Whatever the Church does lessens the burden upon the State, but the conviction has grown that the State is responsible, and should be held responsible, and this may be said without in any degree lessening the responsibility that any church may feel for the care of its own. Churches are powerless to supply universal co-operation, because of their individual limitations, but they can assist and do assist in a general organization of charity.

CHARITIES

Out of this feeling of the necessity for general co-operation in charity, organized charity has grown. To every student of sociology, the conviction comes that organization is necessary in the distribution of charity. The first step in this direction was the formation of relief societies, designed to replace indiscriminate alms-giving by individuals, and intended to increase the funds available for the help of classes that might have been neglected. Then followed the associations for improving the condition of the poor, which were not to deal in relief except in so far as relief might tend to the permanent elevation of those relieved. The relief societies increased in numbers, but the organizations for the improvement of the condition of the poor have generally lost sight of the fundamental purpose of the organization, and have developed into mere relief societies. Neither filled the want, and so a third form of organized charity came into existence. This is designated as "The Charity Organization Society."

The first thing done by the Charity Organization Society is to investigate. On this point, the evidence of Edward T. Devine, Ph.D., general secretary of the Charity Organization Society of the city of New York, may be taken as authoritative. He says in his book, 'The Practice of Charity':

In modern organized charity, investigation has come to mean something more than it had meant for those who had proclaimed the necessity for discriminating between the deserving and the undeserving. Investigation is not solely or even primarily for the purpose of thwarting the expectations of impostors. It is not even merely a device for preventing the waste of charity upon unworthy objects, in order that it may be used for those who are really in need. Investigation is rather an instrument for the intelligent treatment of distress. It is analogous to the diagnosis of the physician who does not attempt to treat a serious malady from a glance at its superficial indications, but who carefully inquires into the hidden and early manifestations of the disease, and seeks to know as much as possible of the complicating influences with which he must reckon in effecting a cure. Investigation, therefore, while it should never be inconsiderate or blundering, or heartless, must be painstaking, conscientious and honest. This kind of an investigation has been developed as one feature of organized charity and its possibilities have been only gradually unfolded, and they are realized only gradually in the experience of individual workers. A bad investigation may be too full or too meagre, or it may be neither. The investigation is made not for its own sake, but as a necessary step in the careful remedy of the defects or misfortunes that have brought the applicant to seek relief. In the majority of cases, if the investigation is wise and complete, it will reveal personal sources and facts which will enable the situation to be met without calling in outside aid, and in this way, in the large proportion of instances, investigation might be said to become a substitute for relief.

The Charity Organization Society not only insists on investigations, but on co-operation. On this point, Mr. Devine has this to say:

By co-operation is meant not merely agreement among various societies and organized agencies, upon general plans of co-operation, but rather co-operation in dealing with individual cases of distress upon the basis of facts as ascertained by investigation. It involves, in other words, acceptance of the plan of relief which is calculated to remedy the defects or to supply the deficiencies that have been discovered. This may mean that each of the co-operating individuals or societies shall supplement the efforts of the others by contributing part of the money or work needed, or it may mean that they will agree to a division of the work, each leaving to the other the part for which its facilities are adapted; or it may mean a division of the cases to be dealt with, each

agreeing to leave entirely to the other such classes of individuals or families whose needs are to be studied and adequately met by the agency to which they are assigned. One of the simplest forms of co-operation is that between the Church and the relief agency, secured by either directly from the other in the case of a given family, or secured by the agent of the Charity Organization Society from both. In this case, the material needs should be supplied by the relief agency, and the Church should provide the necessary spiritual oversight and the necessary formative influences for the children, and, if necessary, reformative influences for older members of the family. It sometimes happens that the family has no need of reformation; that it contains within itself all the necessary resources for education and training, while the financial income alone is lacking, or not sufficient. Even in such circumstances, another friend may not be unwelcome in sickness or in trouble and in periods of unusual difficulty. Enlargement of social opportunities may all be entirely appropriate.

In order to carry out a scheme so comprehensive as this, a machine was necessary, and charity organization made a machine, not merely to investigate objects of charity and to promote co-operation among all charitable agencies, but to keep a record of all work done in charity, and to employ individuals, competent and trained, to do that work. It has even gone further, and is agitating the possibility of establishing a school for workers in charity, whose ultimate purpose is to receive pay for charitable work. Organized charity, by its insistence upon co-operation and by its intelligent discussion of all matters pertaining to charity, exerts a powerful influence upon the State in its relation to charity. There can be no step backward by the State in its treatment of its dependents, which organized charity will not at once detect and seek to stop. The experience of its years of struggle to benefit the poor must be learned by officials having charge of public charitable institutions, and must be practised by them. The good done by organized charity is not confined to the relief that it gives individuals, or to the fraud that it detects, or to the imposition that it prevents, but it extends to the making of public opinion about charitable matters which forces good government in public charitable institutions. The problems of charity are many and difficult, and humanity has been wrestling with them through the ages, but the sum total of the effort of man to help man, while not wholly satisfactory, is eminently encouraging.

The answer has been made with varying degrees of satisfaction to the question as to what should be done with the insane, the sick poor, the dependent child, the imbecile, the epileptic, and to almost every other class, save one, and that is the adult pauper. This is the hardest of all charitable problems. The old person who is destitute, who is driven to ask and to expect public alms, is practically hopeless under existing conditions. He is a dead leaf fallen from the tree of life, swept away into a corner with a heap of others to await dissolution. There ought to be some greater discrimination in the treatment of adult paupers. Indeed, there ought to be some means of saving certain persons destitute in their old age from the demoralization and degradation of living in public institutions at public expense. The influences that drive an individual into an almshouse ought to be considered in his treatment after he is received there. The man who has tried all his life to be respectable and

CHARITIES

independent and has failed, through no lack of effort on his own part, should not be compelled to associate in his last days with the utterly demoralized and vagabond type, that never made an effort to be better than it is. The individual that still preserves some remnant of self-respect should not be compelled to associate with those that have lost all self-respect. Indeed, there are certain persons compelled in their old age to accept public charity that ought not to be sent to an almshouse at all. This idea has been grasped with more or less vagueness in all civilized communities, and efforts have been made to put it into practice. England has made some study of the subject, and Germany has gone so far as to put into practice a scheme to prevent helplessness and resourcelessness in old age. The German scheme compels each man to save during the time that he is able to work, something of his earnings, so that he shall not be destitute when he is no longer able to work. It is really compulsory insurance. German authorities claim that it has worked advantageously, and from the point of view that it has saved some men from destitution in their old age, this cannot be denied. The difficulty about the scheme is, that it may transfer the burden from one class to another. The wages paid for labor in Germany, as in other countries, are not superfluous. Any plan to take away the wages of a working man from his daily necessities, merely to give him a pension when he is old, is not satisfactory unless it can be demonstrated that his wage is in excess of his necessities. It is not charitable to deprive a man of his immediate necessities in order to meet future necessities. It is worse than uncharitable to deprive a man's family of their necessities in order to prevent him from becoming a charge on the community in his old age. It were better to let him use his wage, even all of it, to protect and develop his family, even if the more prosperous members of the community should have to support him in his old age by general taxation. Moreover, there will always be a class, in spite of any system of compulsory insurance, which will not qualify to profit by a pension. There are a thousand causes to prevent a man from going into an insurance scheme, as well as to cause him to drop out of it after he has gone into it; sickness, loss of employment, starvation wages, matters over which he can have no control, will interfere to deprive him of the benefits of such insurance. What is to be done with him then? He must still be taken care of. Therefore, Germany's experiment of compulsory insurance does not solve the problem satisfactorily. The most radical and progressive step taken in the care of the adult pauper was made by New Zealand some five years ago. In the preamble of the Old Age Pension Act, passed by the New Zealand parliament in 1898, these words occur:

It is equitable that deserving persons who, during the prime of life, have helped to bear the public burdens of the colony by the payment of taxes, and to open up its resources by their labor and skill, should receive from the colony a pension in their old age.

There is no suggestion of charity in this proposition. It is a demand for justice and right. There is nothing said about relief from the burden of the care of these people in their

old age, or that it is humane and kindly and charitable to care for them; but the claim is made that it is theirs by right and they ought to have it. On this ground, and this alone, do the New Zealanders, in their legislation, propose to make old age not only comfortable, but honorable in their community. The suggestion here is not one of charity, but of gratitude. The act was passed and is in full operation in New Zealand, but it is too early yet to say what the result will be. By the New Zealanders it is regarded as an experiment. But whatever the result may be, it has at least sounded a new note in the treatment of the aged poor, which is certain to receive an answering echo in the hearts of all who believe in justice.

It may be urged that the New Zealand plan discourages frugality and encourages paternalism. The man who knows that the State is going to take care of him when he shall have reached a certain age, will not make as great an effort to prosper as the man who knows that his comfort in old age will have to depend upon the fruits of the labor of his youth and full manhood; and there must still be those in every community, even in New Zealand, who do not come under the preamble of the Old Age Pension Act of New Zealand, for there are those who have never helped to bear the public burdens by the payment of taxes, or to open up the resources of the country by their labor and their skill. These, fallen into destitution in their old age, must be taken care of in some way. If they are to be taken care of outside of the Old Age Pension Act, then it does not answer the question. If they are to be included in the Pension Act, in spite of their non-productiveness, then the man who is worthless as a member of the community is treated on the same plane as the one who is worthy, and a premium is placed on worthlessness. There ought to be some better solution of this problem of caring for the respectable destitute person than that contained in either the German insurance scheme or the New Zealand Old Age Pension Act. There is no doubt that the community owes something to an individual who has worked all his life. Such a person should not be sent to the almshouse when he can work no longer. He should be able to go to the treasury of the community, not as an applicant for alms, but as a claimant for his own, and say, "The fruit of my labor is shown in the general prosperity of this community. Certain conditions have interfered with my sharing in that prosperity sufficiently to protect me from want in my old age, but by right and justice a share is mine, and I have come to collect it." At least enough to keep him supplied with the necessaries of life should be at his command on the establishment of his rightful claim to it, and there should be no difficulty in his getting it. Just how this can be done is a problem for students of sociology. New Zealand has taken a novel step, and the world is watching the outcome. It is not a question of charity, but a question of right, growing out of charity, and the answer will come, even as all the other answers to difficult problems in relation to the human race have come, through the best, the most disinterested, and the most earnest thought of the world.

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CHARITON — CHARLES THE GREAT

Chariton, kăr'ĩ-tõn, Greek prose writer: fl. 5th or 6th century A.D. He was the author of a romance which describes the loves and adventures of Chæreas and Callirrhoë. Critics generally think that the birthplace usually assigned to the author is fictitious, and that it is by no means certain that he was a native of Aphrodisias in Caria. The romance was first published with a learned commentary by D'Orville (3 vols. 4to, Amsterdam 1750), from a MS. in Florence, the only one yet known.

Chariton, chăr'ĩ-tõn, Iowa, city and county-seat of Lucas County, situated on the Chariton River, and on the Chicago, B & Q. R.R. It has several manufacturing interests, including flour-mills, carriage factories, and manufactories of agricultural implements. Pop. (1900) 3,989.

Charity, one of the three great theological virtues, consisting of love to God and to men, or the disposition to love God with all our heart and our neighbor as ourselves. In a narrower sense, it signifies kindness and goodwill toward mankind in general, and in a still narrower sense, the giving of alms and the alms itself. Organized charity is the system of poor relief carried out by bodies of a quasi-public character, such as the Charity Organization Society in New York. See PUBLIC CHARITIES.

Charity, Sisters of. See ORDERS, RELIGIOUS.

Charlemagne, shăr'lě-măn. See CHARLES THE GREAT.

Charlemont (shăr-lě-mõn) and **Givet**, zhē-vā, France, a fortified stronghold in the department of the Ardennes. The works occupy both banks of the Meuse, about 25 miles above Namur, at the junction of several roads, on a steep mountain, and completely command the river. They consist of four fortresses, two of which, Charlemont and Great Givet, lie on the left bank of the Meuse, and the other two, Little Givet and Mont d'Haur, upon the right. The fortification is calculated for a garrison of 11,000 men, but in case of necessity can contain 25,000 and may be defended by 3,000 to 4,000. The castle and small town of Charlemont were built in 1555 by Charles V. Louis XIV. enlarged it by fortifying the small town of Givet, which lies at the foot of the hill, and by increasing the fortifications of Charlemont. The Givets and Mont d'Haur capitulated to the Prussians in 1815, but Charlemont was not taken.

Charleroi, shăr-lě-rwä, Belgium, a town in the province of Hainaut, on both sides of the river Sambre, 20 miles east-northeast of Mons, the low town standing on the right and the middle town and high town on the left bank. The only public building of importance is the parish church, which was built by Louis XIV. Charleroi possesses a college, an academy of design, a hospital, and several schools. It stands in a densely populated district with productive coal and iron mines, which have given rise to flourishing industries; it may be considered the centre of the Belgian iron trade. It was fortified by the Spaniards in 1666 and named for Charles II. of Spain. Pop. 25,000.

Charleroi, shăr-lě-roi', Pa., city of Washington County, on the Monongahela River and on the Pittsburg, V. & C. R.R. Over \$2,000,000 of capital is invested in the manufactures here, which include glass-works of various sorts. Pop. (1900) 5,930.

Charles Barromeo, SAINT, archbishop of Milan and cardinal: b. Milan 2 Oct. 1538; d. 1584. He came of an illustrious family, and his uncle was occupying the apostolic chair under the name of Pius IV. After refusing to consider the earnest prayers of his uncle to marry and thus perpetuate the family, which, in 1562, lost its head in the death of his brother Federico, he was ordained priest, and, notwithstanding his reluctance, was soon created cardinal and appointed archbishop of his native city. Contrary to the desires of Pius IV., Charles decided to assume the active government of his diocese, and he had scarcely returned to Milan ere a marvelous improvement in morals and learning was made manifest. Among the poor he distributed his large fortune, and when the pest appeared he sold or gave away the ornaments and furniture of his house, and went about like the humblest priest, consoling and administering the sacraments to the dying. His ceaseless labors in the cause of ecclesiastical discipline, his building of churches and monasteries, his constant preaching to the people and writing for the clergy, and his personal austerities brought his ideal life to a close at the early age of 46 years. His body reposes under the high altar of the Milan Cathedral, and as the patron saint of the city his feast is celebrated with great solemnity on 3 November. Consult his 'Life' in the *Ballandists*, by Godean, Paris; Dieringer, and Werfer.

Charles Martel, king of the Franks: b. about 689 A.D.; d. 22 Oct. 741. He was a son of Pepin Héristal (mayor of the palace under the last kings of the Merovingian dynasty). His father had governed under the weak kings of France with so much justice, and so much to the satisfaction of the people, that he was enabled to make his office hereditary in his family. Chilperic II., king of the Franks, refusing to acknowledge Charles Martel as mayor of the palace, the latter deposed him and set Clothaire IV. in his place. After the death of Clothaire he restored Chilperic, and subsequently placed Thierris on the throne.

Charles the Great, or **Charlemagne** (CAROLUS MAGNUS), king of the Franks, and subsequently emperor of the west: b. probably at Aix-la-Chapelle 2 April 742; d. there 28 Jan. 814. His father was Pepin the Short, king of the Franks, son of Charles Martel. After the decease of his father, in 768, he was crowned king, and according to the wish of Pepin divided the Frankish dominions with his younger brother, Carloman; but the conditions of this partition were several times altered, without being ever adjusted to the satisfaction of the parties. Their mutual discontent was fostered principally by the king of the Lombards, Desiderius (the father-in-law of both princes), because Charlemagne had repudiated his wife. Desiderius sought revenge for the rejection of his daughter by exciting and encouraging commotions in the realm, in which he was assisted by the circumstance that the nobles aspired to independence. The people of Aquitania were the first who attempted to become independent. Charlemagne marched against them with rather a small army; but he relied on the assistance of his brother, Carloman, to whom a portion of Aquitania then belonged. Carloman appeared, indeed, on the field, but at the decisive moment

CHARLES THE GREAT

deserted his brother, who was obliged to sustain alone an unequal conflict. His great courage and conduct, after a long and doubtful contest, procured him the victory, and the insurgents submitted (770). At Carloman's death in 771, and after the flight of his wife and her two sons to her father in Italy, Charlemagne made himself master of the whole empire, the extent of which was already very great, as it embraced, besides France, a large part of Germany. He now formed the plan of conquering the Saxons, for which his zeal for the diffusion of Christianity served him as a pretence. The Saxons, in possession of Holstein and Westphalia, preferred pillaging to peaceful occupations, and a wandering to a settled mode of life. An irruption into the territory of the Franks was the alleged cause of the first war which Charlemagne began against them in 772. The other wars were produced by the rebellions of this warlike nation, which was never reduced to complete submission till the peace of Seltz, in 803, after it had embraced Christianity. A part of the Saxons Charlemagne removed to Flanders and Switzerland, and their seats were occupied by the Obotrites, a vandal tribe in Mecklenburg. The famous pillars called *Irmingsäulen* were destroyed as monuments of pagan worship. During 32 years did the Saxons resist a conqueror who, striving with equal eagerness to convert and to subdue them, never became master of their country till he had transformed it almost into a desert. They might have made a more successful defense had they not been distracted by internal dissensions. The most celebrated of their leaders was Wittikind, and next to him Albio, who finally embraced Christianity in 783.

While he was combating the Saxons on the banks of the Weser, Pope Adrian implored his assistance against Desiderius, who had torn from him the exarchate of Ravenna, which Pepin the Short had presented to the holy see, and who was urging the Pope to crown the nephews of Charlemagne, that Charlemagne himself might be considered a usurper. Charlemagne immediately left Germany and marched with his army to Italy. Desiderius fled to Pavia, which was bravely defended by the Lombards. The city finally fell, and Desiderius, with the widow and sons of Carloman, were carried prisoners to France. Desiderius ended his life in a monastery. In 774 Charlemagne was crowned King of Lombardy with the iron crown.

In 778 he repaired to Spain to assist a Moorish prince, conquered Pampeluna, made himself master of the county of Barcelona, and spread the terror of his name everywhere. But on his return his troops were surprised in the valley of Roncesvalles by some Saracens, in connection with the mountaineers, the Basques, and the rear-guard defeated; remarkable from the circumstances that Roland, one of the most famous warriors of those times, fell in the battle. (See RONCESVALLES.) The disaffection of the tribes of Aquitania induced Charlemagne to give them a separate ruler: for this purpose he selected the youngest of his sons, Louis (called *le Débonnaire*). The Lombards were no less turbulent, and the Greeks made incessant efforts to reconquer Italy; and the nobles to whom he had intrusted a part of the sovereignty of this country, evinced little fidelity. He therefore gave them his second son, Pepin, for a

monarch; his eldest son, Charles, remaining constantly with him, and assisting him in his manifold undertakings. In 781 he caused these two sons to be crowned by the Pope in Rome, hoping to render the royal dignity inviolable in the sight of the people. Charlemagne had another son, also called Pepin, who was the oldest of all his children, being the son of his divorced wife. This circumstance probably inspired the monarch with an aversion to the elder Pepin, and prevented him from admitting him to a share in the government.

After returning from Spain Charlemagne was again obliged to take the field against the Saxons. The year 790, the 22d of his reign, was the only one which he passed without taking up arms. As his power increased, he meditated more seriously the accomplishment of the plan of his ancestor, Charles Martel, to restore the Western Empire. On Christmas Day (800) he was proclaimed Cæsar and Augustus by Pope Leo III.; he was invested with the ornaments of the ancient Roman emperors, and the only thing forgotten was, that the empire could not subsist long in a family where the authority was, by law, divided among the children of the deceased monarch. Pepin, king of Italy, died in 810, and his death was followed the next year by that of Charles, the eldest. Thus of his legitimate sons only one remained, Louis, king of Aquitania, whom Charlemagne adopted as his colleague in 813. He was buried at Aix-la-Chapelle, his favorite and usual place of residence. He was deposited in a vault, where he was placed on a throne of gold, in full imperial costume. The sepulchre was sealed, and over it was erected a kind of triumphal arch, on which were the words, "Here lies the body of Charles, the great and orthodox emperor, who gloriously enlarged, and for forty-seven years happily governed, the empire of the Franks."

Charlemagne was a friend of learning; he deserves the name of restorer of the sciences and teacher of his people. He attracted by his liberality the most distinguished scholars to his court; among others, Alcuin, from England, whom he chose for his own instructor; Peter of Pisa, who received the title of his grammarian; and Paul Warnefried, better known under the name of Paulus Diaconus, who gave the emperor instruction in Greek and Latin literature. By Alcuin's advice, Charlemagne established an academy in his palace at Aix-la-Chapelle, the sittings of which he attended with all the scientific and literary men of his court—Leidrades, Theodulphus, the archbishops of Trèves and Mentz, and the Abbot of Corvey. All the members of this academy assumed names characteristic of their talents or inclinations. One was called Damætas, another Homer, another Candidus; Charlemagne himself took the name of David. From Italy he invited teachers of the languages and mathematics, and established them in the principal cities of his empire. In the cathedrals and monasteries he founded schools of theology and the liberal sciences. He strove assiduously to cultivate his mind by intercourse with scholars; and, to the time of his death, this intercourse remained his favorite recreation. His mother-tongue was a form of the Teutonic, but he spoke several languages readily, especially the Latin. He was less successful in writing, because he had not applied

CHARLES

himself to it till he was further advanced in years. In the winter he read much, and even caused a person to read to him while he took his meals. He endeavored to improve the liturgy and church music. He was desirous of introducing the Roman liturgy into his states; but the clergy, who clung to the ancient usages, offered some resistance. Several churches, however, complied with the wish of the monarch, and others mingled the Roman and Gallican liturgy. He attempted to introduce uniformity of measures and weights, but was unable to accomplish his design. Another great plan of his was to unite the Rhine with the Danube, and consequently the Atlantic with the Black Sea, by means of a canal. The whole army was employed on the work; but its accomplishment was prevented by want of knowledge of hydraulic architecture. The arts, however, under his patronage, produced other monuments of his fame. The city of Aix-la-Chapelle received its name from a splendid chapel which he caused to be built of the most beautiful Italian marble. The doors of this temple were of bronze, and its dome bore a globe of massive gold. The imperial palace was built in the highest style of splendor. Charlemagne also erected baths, in which more than one hundred persons could swim in warm water. He was himself very fond of swimming, and frequently used these baths, with all the nobles of his court, and even with his soldiers. At Seltz, in Alsace, he had a no less splendid palace. To Charlemagne France is indebted for its first advances in navigation. He built the lighthouse at Bologne, and constructed several ports. He encouraged agriculture, and made himself immortal by the wisdom of his laws. Thus his law *de villis* is esteemed a monument of his views on rural economy. His fame filled even the East. He received ambassadors from the patriarch of Jerusalem, from the Emperors Nicephorus and Michael, and was twice complimented with embassies from Harun al-Rashid, the famous caliph of Bagdad, all of which he received with a splendor unexampled even in the East. He convened councils and parliaments, published capitularies, wrote many letters (some of which are still extant), a grammar, and several Latin poems. His empire comprehended France, most of Catalonia, Navarre, and Aragon; the Netherlands, Germany as far as the Elbe, Saale, and Eyder, Upper and Middle Italy, Istria, and a part of Sclavonia.

In private life Charlemagne was exceedingly amiable: a good father and generous friend. His domestic economy afforded a model of frugality; his person, a rare example of simplicity and greatness. He despised extravagance of dress in men, though, on solemn occasions, he appeared in all the splendor of majesty. His table was very plain. He was large and strong; his height, according to Einhard, equaled seven times the length of his foot. His head was round; his eye large and lively; his nose of more than common size; his countenance had an agreeable expression of serenity. His gait was firm; his bearing manly. He enjoyed perfect health till the last four years of his life, when he was attacked by fevers, and began to limp. In summer he was accustomed to repose for two hours after dinner, but at night he slept uneasily. He wore the dress of his coun-

try; on his body a linen shirt, over which was a coat with a silk border, and long breeches. For his outer dress he wore a cloak, and always his sword, the hilt and belt of which were of gold and silver. He possessed a natural, impressive eloquence, and in his expression of countenance there was something to excite respect, united with gentleness and kindness. See Einhard, 'Vita Caroli Magni'; Gaston Paris, 'Histoire Poétique de Charlemagne' (1865); Guizot, 'Charlemagne and the Carolingians' (1880); Brosien, 'Karl der Grosse' (1885); Mombert, 'History of Charles the Great' (1888); Burr, 'Charlemagne' (1888); Hodgkin, 'Charles the Great' (1897); Dairs, 'Charlemagne' (1900).

Charles I., king of Great Britain and Ireland: b. Dunfermline, Scotland, 19 Nov. 1600; d. London 30 Jan. 1649. He was the third son of James VI. and Anne of Denmark. Soon after the birth of his son James succeeded to the crown of England, and on the death of Prince Henry in 1612, Robert, the second son, having died in infancy, Charles became heir-apparent, but was not created Prince of Wales till 1616. Little is recorded of him previous to his romantic journey into Spain in company with Buckingham, in order to pay his court in person to the Spanish infanta. Through the arrogance of Buckingham this match was prevented, and the prince was soon after contracted to Henrietta Maria, daughter of Henry IV. of France. In 1625 he succeeded to the throne on the death of his father. The first Parliament which he summoned, being much more disposed to state grievances than grant supplies, was dissolved; and by loans and other expedients an expedition was fitted out against Spain which terminated in disgrace and disappointment. In the next year a new Parliament was summoned, and the disgust and jealousy prevailing between the king and this assembly laid the foundation of the misfortunes of his reign. The House of Commons held fast the public purse, and he intimated a design of following new counsels should they continue to resist his will, and suddenly and angrily dissolved them, after a short session, while they were preparing a remonstrance against the levying of tonnage and poundage without consent of Parliament. Charles then began to employ his threatened mode of raising funds by loans, benevolences, and similar unpopular proceedings; which, however partially sanctioned by precedent, were wholly opposed to the rising notions of civil liberty, and to the constitutional doctrine which rendered the Commons the guardian and dispenser of the public treasure. His difficulties were further increased by a war with France, intended to gratify the private enmity of Buckingham, who added to the odium against him by an ill-fated expedition to assist the Huguenots of Rochelle.

In 1628 the king was obliged to call a new Parliament, which showed itself as much opposed to arbitrary measures as its predecessor, and after voting the supplies prepared a bill called "A Petition of Right, Recognizing all the Legal Privileges of the Subject," which, notwithstanding the employment of all manner of arts and expedients to avoid it, Charles was constrained to pass into a law.

CHARLES

The assassination of Buckingham soon after by Felton removed one source of discord, but the Parliament which met in January 1628 manifested so determined a spirit against the king's claim of levying tonnage and poundage by his own authority, that it was suddenly dissolved, and Charles was determined to try to reign without one. For this purpose, having judiciously terminated the pending wars between France and Spain, he raised Sir Thomas Wentworth, afterward so celebrated as Lord Strafford, to the principal place in his councils. This able statesman had begun his political career in opposition to the court, but having been gained over, was by his austerity, talent, and firmness, an exceedingly fit instrument to curb the spirit of resistance to prerogative, which had become so strong among the Commons. In ecclesiastical affairs Charles, unhappily for himself and the Church, was guided by the counsels of Laud, then bishop of London, a prelate whose learning and piety were accompanied by a zeal as indiscreet as intolerant.

Under these counsels about 11 years passed away in the execution of plans for raising money without the aid of Parliament, with other dangerous expedients. The arbitrary courts of high commission and star chamber, in the hands of Laud, also exercised in many instances the most grievous oppression. In 1634 ship money began to be levied, which being strictly applied to naval purposes, the nation at large acquiesced in it with less than usual repugnance; and some writers, who courageously attacked the court against the principle, were treated with so much severity that others were deterred from following their example. So desperate did the cause of liberty at this time appear, that great numbers of the Puritans emigrated to New England, and by order of the court a ship was prevented from sailing, in which were Sir Arthur Hazelrig, John Hampden, and Oliver Cromwell. It was in 1637, not long after this remarkable event, that Hampden commenced the career of resistance by refusing to pay ship money, the right to levy which, without authority of Parliament, he was determined to bring before a court of law. His cause was argued for 12 days in the court of exchequer; and although he lost it by the decision of 8 of the judges out of 12, the discussion of the question produced a very powerful impression on the public mind.

It was in Scotland, however, that formal warlike opposition was destined to commence. From the beginning of his reign Charles had endeavored to introduce into that country a liturgy copied from the English—an innovation which produced the most violent tumults, and ended in the formation of the famous "Covenant" in 1638, by which all classes of people mutually engaged to stand by each other. The Covenanters levied an army, which the king, opposed by an ill-disciplined English force, so equivocally inclined, that, not able to trust it, Charles agreed to a sort of pacification. His finances being exhausted, after an intermission of 11 years he again assembled a Parliament, which, as usual, began to state grievances previous to granting supplies. Losing all patience, the king once more hastily dissolved it, and prosecuted several members who had distinguished themselves by their opposition. Raising money in the best manner he could devise, an English army was again made to proceed

toward the north; but, being defeated by the Scots, it became obvious that affairs could no longer be managed without a Parliament, and in 1640 that dreaded assembly was again summoned, which proved to be the famous Long Parliament, whose career forms so memorable a portion of English history. Charles soon found himself obliged to be a comparatively passive spectator of the ascendancy of the democratic portion of the Constitution, and was obliged, both in Scotland and in England, to yield to the torrent which assailed him.

In the meantime a flame burst out in Ireland, which had no small effect in kindling the ensuing conflagration at home. The oppressed Roman Catholic population of that country, during the confusion of the times, rose against the government for the purpose of regaining their rights. Very exaggerated accounts of the massacre of the Protestants are given by several of the historians. Later writers have established the fact that the number who perished in this insurrection was not great.

The Parliament being summoned, the king left the conduct of the war entirely to it; but it now became evident that the Commons intended systematically to pursue their advantages, and to reduce the crown to a state of complete dependence. They framed a remonstrance containing a recapitulation of all the errors of the reign; renewed an attempt for excluding bishops from the House of Lords; passed ordinances against superstitious practices and so inflamed the popular odium against the Episcopal orders as to intimidate its members from attending to their duty in Parliament.

At length, it being apparent that either zealous adherents of prerogatives, or those anxious to establish the government on a more democratic basis, must give way, Charles caused his attorney-general to enter, in the House of Peers, an accusation against five leading members of the Commons, and sent a serjeant-at-arms to the House to demand them. Receiving an evasive answer, he, the next day, proceeded himself to the House, with an armed retinue, to seize their persons. Aware of this intention, they had previously withdrawn; but the king's appearance with a guard caused the House to break up in great disorder and indignation. The accused members retired into the city, where a committee of the House was appointed to sit, and the city militia was mustered under a commander appointed by Parliament, which also demanded the control of the army. Here the king made his last stand, the matter having now arrived at a point which arms alone could decide. The queen fled to Holland to procure ammunition, and Charles, with the Prince of Wales, proceeded north, and for a time fixed his residence at York. The king was received in his progress with great demonstrations of loyalty from the gentry; and many eminent and virtuous characters, the conscientious opposers of his arbitrary measures in the first instance, now joined his party. On the other hand, all the Puritans, the inhabitants of the great trading towns, and those who had adopted republican notions of government, sided with the Parliament; and in no public contest was more private and public virtue ranged on both sides, however alloyed, as in all such cases, with ambition, bigotry, and the baser passions. The first action of consequence was the battle of Edge Hill

CHARLES

23 Oct. 1642, which, although indecisive, enabled the king to approach London, and produce considerable alarm. Nothing decisive, however, happened against the royal side till the battle of Marston Moor in 1644, which was gained chiefly by the skill and valor of Cromwell. The succeeding year completed the ruin of the king's affairs, by the loss of the battle of Naseby.

Thenceforward a series of disasters attended his armies throughout the kingdom, and he took the resolution of throwing himself into the hands of the Scottish army, then lying before Newark, 5 May 1646. He was received with respect, although placed under guard as a prisoner; and, a series of abortive negotiations ensuing, an agreement was made with Parliament to surrender him to their commissioners, on the payment of a large sum, claimed as arrears by the Scottish army. The king was accordingly surrendered to the commissioners appointed 30 Jan. 1647, and carried, in the first place, to Holmby House, in Northamptonshire; subsequently, to the headquarters of the army at Reading; and soon after to Hampton Court. In the meantime, however, the army and Independents becoming all powerful, he was led into some fears for his personal safety, and, making his escape with a few attendants, proceeded to the south coast. Not meeting a vessel, as he expected, he crossed over to the Isle of Wight, and put himself into the hands of Hammond, the governor, by whom he was lodged in Carisbrooke Castle.

While the king was in this situation, the Scots, regretting the manner in which they had delivered him up, and indignant at the proceedings of the English, marched a considerable army to his relief, under the Duke of Hamilton. This force, although strengthened by a large body of English royalists, was entirely routed and dispersed by Cromwell at Preston, as were the insurgents in Kent and Essex by Fairfax. During this employment of the army and its leaders a new negotiation was opened with the king in the Isle of Wight, who agreed to nearly everything demanded of him, except the abolition of Episcopacy; and so much had it now become the interest of the Parliament itself to comply with him, that a vote was at length carried, that the king's concessions were a sufficient ground for a treaty. The triumphant army, however, on its return, cleared the House by force of all the members opposed to its views; and thereby procuring a reversal of this vote, the king's person was again seized, and, being brought from the Isle of Wight to Hurst Castle, preparations were made for trying him on the capital charge of high treason against the people. As the House of Lords refused to concur in a vote for this purpose, the Commons declared its concurrence unnecessary; and the king, being conducted to London and stripped of all ensigns of royalty, was brought before the court of justice specially erected for this unprecedented trial, on 20 Jan. 1649.

The behavior of Charles had been calm and dignified throughout his adversity, and in no respect was it more so than on this occasion. Three times he objected to the authority of the court when brought before it, and supported his refusal by clear and cogent arguments. At length, evidence being heard against him on

the proof that he had appeared in arms against the parliamentary forces, sentence of death was pronounced against him. He requested a conference with both Houses, which was rejected, and only three days allowed him to prepare for his fate. After passing the three days in religious exercises, and in tender interviews with his friends and family, he was led to the scaffold. His execution took place before the Banqueting House, Whitehall, on 30 Jan. 1649, where, after addressing the people around him with great firmness and composure, the ill-fated king submitted to the fatal stroke.

Thus died Charles I., in the 49th year of his age. He was, in an eminent degree, temperate, chaste, and religious, and although somewhat cold and reserved in demeanor, was really kind and affectionate. His talents were also considerable; but he was deficient in the decision and self-reliance necessary to superior executive ability. His mind was cultivated by letters and a taste for the polite arts, particularly painting, the professors of which he munificently encouraged; and his collections of work on art show judgment in the selection. To all these personal and private requirements he joined a graceful figure and pleasing countenance, and, under happier circumstances, would doubtless have been regarded as a very accomplished sovereign.

With respect to his political character, as exhibited in the great struggle between himself and the Parliament, it is impossible not to perceive that he strove to maintain a portion of prerogative that had become incompatible with any theory of civil and religious liberty; but it is equally certain that he only sought to retain what his predecessors had possessed. There are periods in the history of every people in which old and new opinions conflict, and a concussion becomes unavoidable; and it was the misfortune of Charles to occupy the throne at a time when the development of the representative system necessarily brought it into conflict with the claims of prerogative. If the Parliament had acquiesced in the kingly pretensions, as usually explained by Laud and the high churchmen of the day, it would have dwindled into a mere registry of royal edicts, like those of France. On the other hand, Charles acted a part which every monarch in his situation may be expected to act; for a philosophical appreciation of the true nature of a political crisis is scarcely to be expected from one who sits upon a throne. The most forcible accusation against Charles is on the score of insincerity. It is asserted that he never intended to fulfill the conditions imposed upon him. This can scarcely be denied; but it is equally certain that some of them might justly be deemed questionable, and may even have been imposed in order to produce that conduct in the king which so naturally followed. See Chancellor, 'Life of Charles I., 1600-25' (1886); Skelton, 'Life of Charles I.' (1898); S. R. Gardiner, 'History of the Great Civil War.'

Charles II., king of Great Britain and Ireland, son of Charles I. and Henrietta Maria of France: b. London 29 May 1630; d. there 6 Feb. 1685. He was a refugee at The Hague on the death of his father, on which he immediately assumed the royal title. He listened to an invitation from the Scots, who had proclaimed him

CHARLES

their king 5 Feb. 1649, and arrived in the Cromarty Firth 16 June 1650. Being obliged to throw himself into the hands of rigid Presbyterians, they subjected him to many severities and mortifications, which caused him to regard that sect ever after with extreme aversion. In 1651 he was crowned at Scone; but the approach of Cromwell soon rendered his abode in Scotland unsafe. Hoping to be joined by the English royalists, he took the spirited resolution of passing Cromwell and entering England, Carlisle readily throwing open its gates to receive him. He was immediately pursued by that active commander, who, with a superior army, gained the battle of Worcester, and Charles, after a variety of imminent hazards, being on one occasion sheltered for 24 hours in the branches of the famous Boscobel oak, reached Shoreham, in Sussex, and effected a passage to France.

It is the province of history to state the circumstances that produced the Restoration, which Gen. Monk so conducted that Charles, without a struggle, succeeded at once to all those dangerous prerogatives which had cost the nation so much blood and treasure, first to abridge and then to abolish. On 29 May 1660, Charles entered his capital amid universal and almost frantic acclamations; and the different civil and religious parties vied with each other in loyalty and submission. His first measures were prudent and conciliatory. Hyde, Lord Clarendon, was made chancellor and prime minister; and an act of indemnity was passed, from which those alone were excepted who were immediately concerned in the late king's death. A settled revenue was accepted in lieu of wardship and purveyance, and the army was reduced. In respect to religion, there was less indulgence; for not only were prelacy and the parliamentary rights of bishops restored, which was to be expected, but an act of uniformity was passed, by the conditions of which nearly all the Presbyterian clergy were driven to a resignation of their livings. In 1662 he married the Infanta of Portugal, a prudent and virtuous princess, but in no way calculated to acquire the affection of a man like Charles. The indolence of his temper and the expenses of his licentious way of life soon involved him in pecuniary difficulties; and the unpopular sale of Dunkirk to the French was one of his most early expedients to relieve himself.

In 1663 a rupture took place with Holland. It was attended, in the first instance, by various naval successes; but France and Denmark entering into the war, as allies of the Dutch, the English were overmatched, and a Dutch fleet entered the Thames, and, proceeding up the Medway, burned and destroyed ships as high as Chatham. The domestic calamities of a dreadful plague in 1665, and of the great fire in London in 1666, added to the disasters of the period. Soon after, Clarendon, who had become very unpopular, and was personally disagreeable to Charles, was dismissed, and sought shelter from his enemies by a voluntary exile. A triple alliance between England, Holland, and Sweden, for the purpose of checking the ambition of Louis XIV., followed. It did honor to the political talents of Sir William Temple, and was one of the few public measures of the reign which deserve approbation. In 1670 Charles threw himself into the hands of the five unprincipled ministers, collectively denominated the

cabal, who supported him in every attempt to make himself independent of Parliament. The party troubles of this reign commenced about this time by the open declaration of the Duke of York, presumptive heir to the crown, that he was a convert to the Roman Catholic religion. Soon after the ministry broke the triple alliance, and planned a rupture with the Dutch; and as the king did not choose to apply to Parliament for money to carry on the projected war, he caused the exchequer to be shut up in January 1672. The naval operations against the Dutch were by no means successful, and a new Parliament being called, which strongly expressed the discontent of the nation, the cabal was dissolved, and a separate peace made with Holland in 1674. Divisions in the cabinet, fluctuations in the king's measures, and parliamentary contests followed, and occupied the next three years, till, in 1677, Charles performed a popular act, by marrying his niece, the princess Mary, to the Prince of Orange. By taking some decided steps in favor of the Dutch he also forwarded the Peace of Nimeguen in 1678. The same year was distinguished by the pretended discovery of the popish plot for the assassination of the king, and the introduction of the Roman Catholic faith. Notwithstanding the infamous characters of Oates and Bedloe, and the improbable nature of their disclosures, their tale, supported by the general suspicions of the secret influence of a Catholic faction, met with universal belief; the Parliament exhibiting nearly as much credulity and heat as the masses. Many Catholic lords were committed; Coleman, the Duke of York's secretary, and several priests hanged; and a venerable nobleman, the Earl of Stafford, beheaded. The Duke of York thought fit to retire to Brussels, and a bill for his exclusion from the throne passed the House of Commons. Such was the state of the country that Charles was obliged to give way to some popular measures, and the great palladium of civil liberty, the Habeas Corpus bill, passed during this session. The temper of the Parliament was so much excited that the king first prorogued and then dissolved it. The court now sought to establish a balance of parties; to distinguish which, the terms Whig and Tory were about this time brought into use.

In 1680 a new Parliament assembled, and the Commons again passed the Exclusion Bill, which was rejected by the Lords. This Parliament was also dissolved in the next year, and a new one called at Oxford, which proved so restive, that a sudden dissolution of it ensued; and, like his father, Charles determined henceforward to govern without one. By the aid of the Tory gentry and the clergy he obtained loyal addresses from all parts of the kingdom, and attachment to high monarchical principles came again into vogue. The charge of plots and conspiracies was now brought against the Presbyterians. The Nonconformists, generally, were also treated with much rigor; and a step of great moment, in the progress to arbitrary power, was the instituting suits at law (*quo warrantos*) against most of the corporations in the kingdom, by which they were intimidated to a resignation of their charters, in order to receive them back so modeled as to render them much more dependent than before. These rapid strides toward the destruction of liberty at length produced the celebrated Rye House plot,

CHARLES

the parties to which certainly intended resistance; but that the assassination of the king was ever formally projected seems very doubtful. It certainly formed no part of the intention of Lord William Russell, whose execution, with that of Algernon Sidney, on account of the plot, forms one of the striking events of this disgraceful reign.

Charles was at this time as absolute as any sovereign in Europe; and had he been an active prince, the fetters of tyranny might have been completely riveted. Scotland, which at different periods of his reign had been driven into insurrection by the arbitrary attempts to restore Episcopacy, was very nearly dragooned into submission; and the relics of the Covenanters were suppressed with circumstances of great barbarity. At his death he received the sacrament according to the rites of the Catholic Church.

The character of Charles II. requires little analysis. He was a confirmed sensualist and voluptuary; and his reign was the era of the most dissolute manners that ever prevailed in England. The stage was an open school of licentiousness, and polite literature was altogether infected by it. Charles was a man of wit, and a good judge of certain kinds of writing, but too deficient in sensibility to feel either the sublime or the beautiful in composition; neither was he generous even to the writers whom he applauded. He possessed an easy good nature, but united with it a total indifference to anything but his own pleasure; and no man could be more destitute of honor or generosity. His ideas of the relation between king and subject were evinced by his observation on Lauderdale's cruelties in Scotland: "I perceive," said he, "that Lauderdale has been guilty of many bad things against the people of Scotland; but I cannot find that he has acted in anything contrary to my interest." Yet, with all his selfishness and demerits as a king, Charles always preserved a share of popularity with the multitude from the easiness of his manners. Pepy's 'Memoirs' and other private documents, however, clearly show the opinion of the more reflecting portion of his subjects; and it is now pretty generally admitted that, as he was himself a most dishonorable and heartless monarch and man, so his reign exhibited the English character in a more disgraceful light than any other in English history. It need not be added that he left many illegitimate children, the descendants of some of whom are still among the leading nobility of the country. The fate of his most distinguished son, the ill-fated Duke of Monmouth, is an affair of history.

Charles (shärl) I. ("le Chauve," or "the Bald"), king of France, son of Louis le Débonnaire: b. Frankfort-on-the-Main 13 June 823; d. 877. He was invested by his father with the kingdoms of Alemania, Burgundy, Provence, and Septimania, and subsequently with that of Aquitaine. On Louis' death in 840, Charles found himself confronted with two enemies — his half-brother Lothaire, who, as eldest son, claimed the whole of the Frank empire of Charlemagne, and his nephew Pepin, who asserted, in right of his father, a preferable claim to the sovereignty of Aquitaine. After considerable bloodshed, a treaty was entered into between Charles and Lothaire at Verdun, by which the

former received, as his share of the dominions of Charlemagne, all those territories comprehended between the ocean on the one part, and the Meuse, the Scheldt, the Saône, the Rhone, and the Mediterranean on the other. His struggle with Pepin was long and obstinate, and in 844 he was obliged to recognize him as king of southern Aquitaine. In 875, by the death of his nephew, the Emperor Louis II., he gained possession of the imperial crown, and thereby provoked the hostility of his brother, Louis the German, who ravaged the territory of Champagne, and otherwise committed great havoc in his dominions. In 877 he proceeded to Italy on a crusade against the Saracens, to which he had been summoned by the Pope, but died when crossing Mount Cenis.

Charles II. ("le Gros," or "the Fat"), king of France, also known as Charles III., emperor of Germany: b. about 832; d. Neidingen, Suabia, 13 June 888. He was the son of Louis the German, and the grandson of Louis le Débonnaire, and was recognized as emperor of Germany by the Pope. In 885 he ascended the French throne, to the prejudice of his cousin, Charles the Simple, whose youth prevented him from asserting his rights, but in 887 was deposed, and the following year died miserably, strangled, as is asserted, by his servants.

Charles III. ("the Simple"), king of France, the posthumous son of Louis the Stammerer: b. 17 Sept. 879; d. 929. On his father's death France was divided between Charles' two brothers, Louis III. and Carloman, and an aristocratic oligarchy. On the death of his brothers he ought in right to have ascended the throne, but his extreme youth prevented his claims being recognized, and his cousin, Charles the Fat, was proclaimed king in 885. On the deposition of the latter in 887 Count Eudes of Paris succeeded in obtaining the crown; but his death in 898, left Charles undisputed king of the whole country. The reign of Charles is chiefly noted for the piratical incursions of the Northmen or Normans, who ravaged the coasts of France, sailed up the principal rivers, and spread such dismay that, to conciliate them and put an end to their devastations, he agreed to cede to their chief, Rollo, the territory of Normandy, to be held as a fief of the French crown. Latterly also Charles' tranquillity was much disturbed by the turbulence of some of his great vassals, who broke into open rebellion, declared the throne forfeited, and proclaimed as king, Robert, brother of Count Eudes. Through the treachery of Herbert, Count of Vermandois, Charles was inveigled into the town and imprisoned in the fortress of Peronne. From this he was only liberated a short time before his death.

Charles IV. ("the Fair"), king of France, third son of Philippe le Bel: b. 1294; d. 1328. In virtue of the salic law he ascended the throne in 1322, to the exclusion of the daughters of Philip the Long. He reigned six years, dying in 1328 without male issue, the last of the direct line descended from Hugh Capet. Isabella, his sister, married Edward II. of England, and was materially aided by Charles in fitting out, along with her paramour Mortimer, the expedition which resulted in the dethronement of her husband.

CHARLES

Charles V. ("the Wise"), king of France, son of John II.: b. Vincennes 21 Jan. 1337; d. there 16 Sept. 1380. While Duke of Normandy, and during the captivity of his father in England, after the battle of Poitiers, he took the title of lieutenant of the kingdom. The vices and extravagance of the court were extreme, and the demands of the States-General for reform, headed by Stephen Marcel, provost of the merchants of Paris, were loudly and persistently urged. This assembly was supported in its claims by Charles the Bad, king of Navarre, who, as grandson of Louis le Hutin, maintained a preferable right to the crown. By artfully temporizing Charles contrived to detach the leading orders from the cause of the states, and having brought about indirectly the assassination of Marcel, succeeded in crushing their party. Meantime his father John still continued in captivity in England till liberated by the Treaty of Brétigny in 1360. Four years afterward he died, leaving Charles as successor to the French crown. The reign of the latter presents a series of combined hostilities and intrigues carried on with the view of establishing his power and extending his dominions. In these he was so far successful as to keep at bay the king of Navarre and deprive the English of a great part of their possessions in France. The magnanimity and wisdom of Charles have been greatly commended by some writers, and if we make due allowance for the times in which he lived, the high character which these have assigned him may not appear overcharged. That in his public administration, however, he was guilty of various acts of perfidy and cruelty cannot be disputed. He possessed some literary tastes, and was the founder of the Bibliothèque Royale. A less beneficial act was the erection of the Bastille, for the purpose of overawing the Parisians, whose outbreaks he had found reason to dread.

Charles VI. ("the Silly"), king of France, and son of Charles V.: b. Paris 3 Dec. 1368; d. 21 Oct. 1422. When his father died he was not 12 years old, and the contending pretensions of his uncles, the Dukes of Anjou, Berry, Burgundy, and Bourbon, rendered his minority a scene of unbounded turbulence and license. In 1385 he was married at Amiens to Isabella of Bavaria. In 1388 he declared himself independent of guardians, and took the reins of government into his own hands. His mild and amiable, though somewhat dissipated character, had already secured for him a considerable share of popularity, when he was overtaken by a fearful calamity, the loss of his reason—a condition in which, with a few lucid intervals, he remained to the end of his days. The origin of this was constitutional, aggravated by a fright and a severe accident. Perhaps at no period in her history was France the scene of greater disasters and miseries than during the reign of this unhappy prince. The rival factions of the Burgundians and the Armagnacs, kept up constantly throughout the country the horrors of a most rancorous civil war; while brigandage and every kind of violence prevailed to the most fearful extent. Such a conjunction afforded the most favorable opportunity for an invader; and accordingly, in 1415, Henry V. of England crossed over to Normandy with a numerous army, took Harfleur by storm, and signally de-

feated the French forces in the battle of Agincourt. Improving these advantages he advanced into the country, gained possession of the capital, and compelled the crazy king to sign the Treaty of Troyes, by which his daughter Catharine was given in marriage to Henry, and the latter acknowledged successor to the French crown after Charles' death. Neither monarch long survived this celebrated paction, both dying within a few months of each other.

Charles VII., king of France, 5th son of Charles VI.: b. Paris 22 Feb. 1403; d. Mehun 22 July 1461. He became, by the successive deaths of his elder brothers, dauphin and heir-presumptive to the crown. On the king of England's death in 1422 his son Henry VI. was proclaimed king of France at Paris. The war with the national party, represented by the Orleanist faction, with the dauphin at their head, was maintained for several years by the English, under the command of the Duke of Bedford. So successfully did the latter conduct operations that Charles was brought to the verge of despair, and almost reduced to abandon the struggle as hopeless, when his fortunes were retrieved by the arrival in his camp of the Maid of Orleans, who by the enthusiasm which she inspired first turned the tide of success against the English. (See JOAN OF ARC.) The fresh spirit thus infused into the breasts of the French was heightened by mismanagement on the part of the English, whose military operations were conducted with greatly diminished efficiency after the death of the Duke of Bedford, while discord and confusion prevailed in the home councils. Through the intervention of the Earl of Suffolk a marriage was concluded between the young king Henry VI. and Margaret of Anjou, niece of Charles VII.'s queen. In the treaty entered into on this occasion the territory of Maine was secretly surrendered to France, and subsequently, on hostilities being resumed between the two countries, the troops of Charles conquered the whole of Guienne, and finally expelled the English from all their possessions in France except Calais. The last years of Charles' reign were embittered by domestic broils, in which his son and successor Louis XI. took a prominent part against his father. So hemmed in at last was the latter by the emissaries of the dauphin that he conceived the idea of Louis having formed a deliberate plan to poison him; and so firmly was this notion rooted in his mind that he could only with the greatest difficulty be induced to take any food. A romantic interest has been thrown around Charles VII. by his early reverses and the re-establishment of French nationality, which he effected mainly through the heroism inspired by the Maid of Orleans. His personal character, however, was weak and contemptible, without energy and without principle, surrendering himself continually to sensual and degrading pleasures. His share in the treacherous murder of the Duke of Burgundy, and base abandonment to her fate of Joan of Arc, are stains on his memory which cannot be effaced.

Charles VIII., king of France, son of Louis XI.: b. Amboise 30 June 1470; d. there 7 April 1498. He succeeded his father in 1483, his sister Anne de Beaujeu acting as regent till he attained the age of 20. In 1491 he mar-

CHARLES

ried Anne, the heiress of Brittany, and thereby annexed that important duchy to the French crown. By so doing, however, he both broke faith with the daughter of Maximilian, king of the Romans, to whom he had been espoused, and also robbed Maximilian of his bride, a marriage by proxy having been already concluded between him and Anne. The leading incident of Charles VIII.'s reign is his Italian expedition and conquest of the kingdom of Naples, having been instigated thereto by Ludovico Sforza, the usurping Duke of Milan. The title pretended to Naples was asserted in virtue of the rights to that sovereignty transmitted by the house of Anjou to the royal family of France. The whole of Charles' expedition reads like a page from one of the old chivalrous romances. With an army of 30,000 men, unprovided either with money or stores, he suddenly crossed the Alps, advanced rapidly southward, and meeting with scarcely any obstruction, arrived before the walls and gained possession of Naples. This conquest, however, he did not retain for many months. Having left 5,000 men to guard his new acquisition he returned to France, and had scarcely reached it when the arms of Gonsalvo de Cordova effected the re-annexation of Naples to Spain. The expedition of Charles VIII. left thus hardly a trace upon the country, but is memorable as the commencement of that series of French incursions into Italy which, under his successors deluged that fair land with bloodshed. He left no children, and was succeeded by his relative, the Duke of Orleans, under the title of Louis XII.

Charles IX., king of France, son of Henry II. and Catharine de Medici: b. St. Germain-en-Laye 27 June 1550; d. 30 May 1574. He ascended the throne at the age of 10, after the death of his brother, Francis II. No regency was appointed, and it was deemed sufficient to write to the Parliament, through the young prince, that he had requested his mother to undertake the administration of the public affairs. The Parliament acquiesced in this resolution, to avoid exciting new contests between the Guises and the princes of the blood. The Duke of Guise, who obtained possession of the person of the young king, was shot by an assassin before Orleans, in February 1563. In his last moments he advised the king and the queen mother to negotiate with the parties. This advice was followed; a treaty was signed 19 March and Havre taken from the English 27 July. The king, who was the same year declared of age, visited the provinces in company with his mother. At Bayonne he had a meeting with his sister Isabella, the wife of Philip II. of Spain. This excited such suspicions in the Calvinists that they took up arms, and immediately formed the plan of attacking the king on his return to Paris. Being warned in season he escaped the danger; but this plot could not fail to arouse the hatred of Charles. After the battle of St. Denis, 1567, in which the constable of Montmorenci lost his life, Catharine entered into negotiations for peace. But the Calvinists reserved a part of the places which they were to have surrendered, and continued to keep up a communication with England and the German princes. A new civil war soon broke out. Notwithstanding the jealousy of Charles, Catharine placed the Duke of Anjou at the head of

the royal army. The Prince of Condé having been shot in the battle of Jarnac in 1569, and the Admiral Coligny having been defeated at Montcontour in the same year, the king concluded peace, in 1570, on terms so favorable to the Calvinists that they seem even to have suspected treachery under them. The heads of that party did not therefore all appear at court when Charles celebrated his marriage with Elizabeth, the daughter of Maximilian II. By degrees this distrust disappeared, and the marriage of the young king of Navarre (afterward Henry IV.) with Margaret, sister of Charles X., seemed to banish every suspicion. This marriage took place 18 Aug. 1572. On the 22d the first attempt was made on the life of Coligny, and on the 24th began that massacre known under the name of the massacre of St. Bartholomew, from having taken place on the night of the festival of that saint. Civil war broke out for the fourth time, and Catharine now became aware of the errors of her policy. Charles could no longer conceal his aversion to her, and was on the point of assuming himself the reins of government, when he died, childless, in 1574.

Charles X., COMTE D'ARTOIS, king of France: b. Versailles 9 Oct. 1757; d. Goritz, Austria, 6 Nov. 1836; grandson of Louis XV. He was the youngest son of the dauphin, and brother of Louis XVI. He spent a dissipated youth, and left France in 1789, after the first popular insurrection and destruction of the Bastille, and at Pilnitz attended the Congress of Princes, for the purpose of opposing the spread of revolutionary principles. After Louis XVI. had accepted the Constitution of 1791, he invited Charles to return to France, but he refused, and the legislative assembly, after stopping his allowance on the civil list, confiscated his property in 1792. He afterward assumed the command of a body of emigrants, and acted in concert with the Austrian and Prussian armies on the Rhine. At a later period he made a descent on the coast of Brittany, but despairing of success, retreated to Great Britain, and resided for several years in the palace of Holyrood at Edinburgh. After the downfall of Napoleon he entered France with the title of lieutenant-general of the kingdom, and issued a judicious proclamation, promising the reign of law and an entire oblivion of the past. In 1824 he succeeded his brother, Louis XVIII., under the title of Charles X., and gained a momentary popularity by the abolition of the censorship of the press, but measures of a very different description soon followed, and the spirit of disaffection was so widely spread that a collision with the popular party became inevitable. Charles X. endeavored to gain the start by what is called a *coup d'état*, and issued his celebrated ordonnances, but victory declared against him, and he was ignominiously driven from the throne in 1830. After formally abdicating in favor of his grandson, the Duke de Bordeaux, he revisited England, resumed his residence for a short time at Holyrood, and finally settled at Göritz in Styria. See Lorieux, 'Histoire de Règne de Charles X.' (1834).

Charles I., king of Germany. See CHARLES THE GREAT.

Charles II., king of Germany. See CHARLES I. of France.

CHARLES

Charles III., surnamed **LE GROS**, king of Germany. See **CHARLES II.** of France.

Charles IV., emperor of Germany, of the house of Luxemburg: b. Prague 14 May 1316; d. there 29 Nov. 1378. He inherited the kingdom of Bohemia, and had been chosen emperor in 1346 by five electors, hoping to occupy the imperial throne without opposition. But the princes of the empire regarded him as a servant of the Pope. He however used every effort to appease his enemies, married the daughter of the Elector of the Palatinate, gave Tyrol as a fief to the Elector of Brandenburg, and was unanimously elected emperor, and consecrated at Aix-la-Chapelle. But no sooner was he crowned than he took possession of the imperial insignia, and conveyed them to Bohemia. In 1354 the emperor went to Italy to be crowned by the Pope; but this favor he purchased on terms which made him an object of ridicule and contempt. He engaged to appear without any armed force. Having been consecrated king of Italy at Milan, he confirmed the Visconti in the possession of all the usurpations of which he had promised to deprive them. He also annulled all the acts of his grandfather, Henry VII., against Florence, and by a treaty concluded at Padua resigned the latter city, with Verona and Vicenza, to Venice. He refused the request of some Romans to claim the city, as belonging to him in the name of the empire, and in a treaty renounced all sovereignty over Rome, the states of the Church, Ferrara, Naples, Sicily, Sardinia, and Corsica, and even took an oath not to return to Italy without the consent of the Pope. Despised by the Guelphs, detested by the Ghibellines, Charles returned to Germany, where he issued the celebrated golden bull, which, till modern times, continued a fundamental law of the German empire. He thus acquired some claims to the public gratitude, but these were soon effaced by the general indignation, excited by the proposal made, with his consent by the papal nuncio, to introduce a tax, equal to the tithe of all ecclesiastical revenues, for the benefit of the holy see. All the members of the diet opposed it; and Charles, in his anxiety to conciliate the princes of the empire, announced that he would propose to the Assembly a reform of the German clergy. The Pope, opposing this proposal of the emperor, exhorted the electors to depose him. Charles immediately relapsed into his accustomed submissiveness, and not only abandoned all his reforms, but even confirmed, in 1359, all the privileges of the clergy, all their present and future possessions, and made them independent of the secular power. Such vacillating conduct subjected him to the contempt of both parties. Under such an emperor Germany could not enjoy internal tranquillity. Bands of robbers plundered the country in all quarters. The emperor left the princes and cities to protect themselves by mutual alliances. The state of Italy was no less melancholy. Tuscany was suffering the evils of anarchy; Lombardy was distracted by civil wars, and the Visconti had made themselves masters of the Milanese. During his residence in Italy, he sold states and cities to the highest bidder, or, if they themselves offered most, made them independent republics. With great treasures he returned to Germany. Gregory XI. having given his consent that his

son Wenceslaus should be elected king of the Romans, he employed his ill-gotten wealth to purchase the votes of the electors, who were irritated at the conduct of the Pope, and, moreover, distributed among them the domains of the empire on the Rhine, and several free imperial cities. Thus he attained his object. To maintain their rights against the arbitrary measures of the emperor, the imperial cities in Suabia formed the Suabian league, which Charles opposed in vain. His reign is notable for the improvement and prosperity of Bohemia; for the founding of the universities of Prague and Vienna; for a terrible persecution of the Jews, and as the period when the sale of letters of nobility commenced in Germany.

Charles V., emperor of Germany and king of Spain (in the latter capacity he is called Charles I.): b. Ghent 24 Feb. 1500; d. Yuste, Spain, 21 Sept. 1558. He was educated in the Netherlands under the care of William of Croy, lord of Chièvres, who taught him history, formed him for affairs of state, and gave him that gravity of manner which he retained through life. After the death of Ferdinand of Spain, his grandfather, in 1516, Charles assumed the title of king of Spain. The management of this kingdom was intrusted to the celebrated Cardinal Ximenes. In 1519 Charles, on the death of Maximilian, was elected emperor. He left Spain to take possession of his new dignity, for which he had to contend with Francis I., king of France. His coronation took place at Aix-la-Chapelle with extraordinary splendor. The progress of the Reformation in Germany demanded the care of the new emperor, who held a diet at Worms. Luther, who appeared at this diet with a safe conduct from Charles, defended his cause with energy and boldness. The emperor kept silent; but after Luther's departure a severe edict appeared against him in the name of Charles, who thought it his interest to declare himself the defender of the Roman Catholic Church.

In a very few years the power of Charles became a source of uneasiness to most other princes of Europe. Pope Clement VII. placed himself at the head of a league of the principal states of Italy against the emperor, but their ill-directed efforts were productive of new misfortunes. Rome was taken by storm by the troops of the constable of Bourbon, sacked, and the Pope himself made prisoner. Charles V. publicly disavowed the proceedings of the constable, went into mourning with his court, and carried his hypocrisy so far as to order prayers for the deliverance of the Pope. Henry VIII. of England now allied himself with the French monarch against Charles, who accused Francis of having broken his word. The war was terminated in 1529 by the Treaty of Cambray, of which the conditions were favorable to the emperor. Charles soon after left Spain, and was crowned in Bologna as king of Lombardy and Roman emperor. In 1530 he seemed desirous, at the Diet of Augsburg, to reconcile the various parties; but not succeeding, issued a decree against the Protestants, which they met by the Schmalkaldic League. Notwithstanding his undertakings in favor of the Roman Catholic religion, Charles always practised moderation toward the Protestants whenever his interest left room for toleration. Nor did the Protestant

CHARLES

princes hesitate to furnish their contingents when he was assembling an army against the Turks. Having compelled Solyman to retreat, he undertook in 1535 an expedition against Tunis, reinstated the dey, and released 20,000 Christian slaves. This success added to his character somewhat of the chivalric, which gave him still more influence in Christendom, and promoted his political projects.

The policy of Charles was to reconcile the two great religious parties, and with this view he alternately threatened and courted the Protestants. After some show of negotiation the Protestant princes raised the standard of war. The emperor declared, in 1546, the heads of the league under the ban of the empire, excited divisions among the confederates, collected an army in haste, and obtained several advantages over his enemies. John Frederick, the elector of Saxony, was taken prisoner in the battle of Mühlberg in 1547. Charles received him sternly, and gave him over to a court-martial consisting of Italians and Spaniards, under the presidency of Alva, which condemned him to death. The elector saved his life only by renouncing his electorate and his hereditary estates, but remained a prisoner. Meanwhile the emperor appeared somewhat more moderately inclined toward the vanquished party. On coming to Wittenberg he expressed surprise that the exercise of the Lutheran worship had been discontinued. He visited the grave of Luther, and said, "I do not war with the dead; let him rest in peace; he is already before his Judge." The Landgrave of Hesse-Cassel, one of the heads of the Protestants, was compelled to sue for mercy. Notwithstanding his promise Charles deprived him of his freedom. After having dissolved the League of Schmalkalden the emperor again occupied himself with the plan of uniting all religious parties, and for this purpose issued the Interim, which was as fruitless as the measures proposed by him at the Diet of Augsburg. Neither was he successful in securing the imperial crown to his son. Discord still agitated public sentiment, and a new war broke out against him. Maurice of Saxony, whom he had invested with the electoral dignity, formed a league, which was joined by Henry II., king of France, the successor of Francis. The preparations had been made with the greatest secrecy. Charles was at Innsbruck superintending the deliberations of the Council of Trent, and meditating great plans against France and Turkey. He was expecting the aid of Maurice when this prince threw off the mask, appeared suddenly at the head of an army, and invaded the Tyrol in 1552 while Henry II. entered Lorraine. Charles was very nearly surprised in Innsbruck. Maurice abandoned the imperial castle to plunder, the Council of Trent was dissolved, and the Protestants dictated the conditions of the Treaty of Passau in 1552. Charles was not more successful in Lorraine. He was unable to recover Metz, defended by the Duke of Guise. In Italy he lost Sienna by a revolt. He withdrew to Brussels, where, hard pressed by his enemies, he became gloomy and dejected, and for several months concealed himself from the sight of every one, so that the report of his death was spread through Europe. His last exertions were directed against France, which constantly repelled his assaults. The Diet of Augsburg in

1555 confirmed the Treaty of Passau, and gave the Protestants equal rights with the Roman Catholics.

Charles, seeing all his plans frustrated and the number of his enemies increasing, resolved to transfer his hereditary states to his son Philip. Having convened the estates of the Low Countries at Louvain, in 1555, he explained to them the grounds of his resolution, asserted that he had sacrificed himself for the interests of religion and of his subjects, but that his strength was inadequate to further exertion, and that he should devote to God the remainder of his days. At that time Charles conferred on Philip the sovereignty of the Netherlands alone. On 15 Jan. 1556 he conferred upon him, in like manner, the Spanish throne, reserving for himself merely a pension of 100,000 ducats. He selected for his residence the monastery of St. Justus, near Plasencia in Estremadura, and here he exchanged sovereignty, dominion, and pomp for the quiet and solitude of a cloister. His amusements were confined to short rides, to the cultivation of a garden, and to mechanical labors. It is said that he made wooden clocks, and being unable to make two clocks go exactly alike, was reminded of the folly of his efforts to bring a number of men to the same sentiments. He attended religious services twice every day, read books of devotion, and by degrees fell into such dejection that his faculties seemed almost impaired. He renounced the most innocent pleasures, and observed the rules of the monastic life in all their rigor.

Charles had a noble air and refined manners. He spoke little, and smiled seldom. Firm of purpose; slow to decide; prompt to execute; equally rich in resources and sagacious in the choice of them; gifted with a cool judgment, and always master of himself. Circumstances developed his genius and made him great. Although he did not scruple to break his promises, he imposed, by the semblance of magnanimity and sincerity, even on those who had already experienced his perfidy. An acute judge of men, he knew how to use them for his purposes. In misfortune he appears greater than in prosperity. He protected and encouraged the arts and sciences, and is said to have picked up a brush which had fallen from the hand of Titian with the words, "Titian is worthy of being served by an emperor." By his wife Eleonora, daughter of Emanuel, king of Portugal, he had one son, afterward Philip II., and two daughters. He had also several natural children. No minister had a decided influence over him. He was indefatigable in business, weighing the reasons on both sides of every case with great minuteness. Wherever he was he imitated the customs of the country, and won the favor of all people with whom he came into contact except the Germans. Gachard, 'Correspondance de Charles Quint' (1859); Stirling Maxwell, 'Cloister Life of the Emperor Charles V.' (1852); Guntram, 'Kaiser Karl V.' (1865).

Charles VI., emperor of Germany, the second son of the Emperor Leopold I.: b. 1 Oct. 1685; d. 20 Oct. 1740. His father destined him for the Spanish throne. The last prince of the house of Hapsburg, Charles II., disregarding the house of Austria, whose right to the Spanish throne was undoubted, according to the

CHARLES

law of inheritance by descent, had by will made Philip, Duke of Anjou, second grandson of Louis XIV., heir of the Spanish monarchy. Accordingly, on the death of Charles II., 1 Nov. 1700, Philip took possession of the vacant kingdom. England and Holland united against him, and this alliance was soon joined by the German empire, Portugal, and Savoy. Charles was proclaimed king of Spain at Vienna, in 1703, and proceeded by way of Holland to England, from whence, in January 1704, he set sail with 12,000 men for Spain, which was almost wholly occupied by the French, and landed in Catalonia. He succeeded in making himself master of Barcelona; but was soon besieged there by his rival Philip V. At the head of a garrison of hardly 2,000 men, he made the most obstinate resistance, till the long-expected English fleet appeared, which compelled the French speedily to raise the siege. This event was followed by alternate reverses and successes. Twice Charles reached Madrid, and twice was he driven from the city. The first time, in 1706, he caused himself to be proclaimed king in the capital, under the name of Charles III. He had been a second time compelled to flee to the walls of Barcelona, when he was informed of the death of his brother Joseph I. According to the will of Leopold, this event placed the double crown of Charles V. on his head; to his claims on Spain it added the more certain possession of the Austrian dominions. But the allies did not like to see so much power united in the same hands. Charles returned to Germany, and on his arrival learned that, at Eugene's suggestion, he had also been elected emperor. His coronation took place at Frankfort, in December 1711; and in the following year he received, at Presburg, the crown of Hungary. At the same time he still retained the empty title of king of Spain. He now prosecuted, under the conduct of Eugene, the Spanish war of succession; the allies concluded a peace with France at Utrecht in 1713, in spite of all the efforts of the emperor to prevent it. He was obliged, in the following year, to sign the Treaty of Rastadt. This treaty secured him in the possession of Milan, Mantua, Sardinia, and the Netherlands. To secure his dominions to his daughter, Maria Theresa, in default of male heirs, Charles strove to induce the powers to guarantee the pragmatic sanction, which settled the succession in her favor. He succeeded in gaining the concurrence of all the European powers. The reign of this prince was marked with perpetual agitations. The succession to the Polish throne, after the death of Augustus II., in 1733, disturbed the peace of Europe. Charles, with Russia, supported the son of this prince; but France and Spain declared themselves for Stanislaus Leczinsky. From this arose a war, which terminated, in 1735, in the loss of the Two Sicilies, and a part of the duchy of Milan. Austria received Tuscany in exchange for Lorraine, and obtained Parma. Hardly had Charles finished this war, when his alliance with Russia involved him anew in a war with the Turks. In 1737 his troops invaded Servia, without any declaration of war, and occupied Nissa. But the Turks renewed their attacks with a continually augmented force, and obliged the emperor, after three unsuccessful campaigns, to cede to them by the Peace of Belgrade, in 1739, Walachia and the Austrian part of Servia, with Belgrade.

Charles VII. (properly CHARLES ALBERT), emperor of Germany: b. Brussels 6 Aug. 1697; d. Munich 20 Jan. 1745. He was the son of Maximilian Emanuel, elector of Bavaria, then governor of the Spanish Netherlands. His youth was spent at the imperial court, and in the war against the Turks he commanded the army of auxiliaries sent by his father. In 1722 he married the daughter of Joseph I., having previously renounced all rights which this marriage might give him to the succession to the throne of Austria. In 1726 he succeeded his father as Elector of Bavaria. He was one of the princes who protested against the pragmatic sanction, guaranteed in 1732 by the Diet of Ratisbon, and in consequence concluded a defensive alliance with Saxony. After the death of Charles VI., in 1740, he refused to acknowledge Maria Theresa as his heiress, founding his own claims to the succession on a testament of Ferdinand I. He was supported by the king of France with a considerable force. In 1741 he was recognized at Lintz as Archduke of Austria. The obstacles thrown in his way by Cardinal Fleury, who wished not to dismember the Austrian monarchy, as well as the want of artillery and ammunition, prevented him from getting possession of Vienna. On the other hand he took Prague, where he was crowned and proclaimed king of Bohemia. In 1742 he was unanimously elected king of the Romans: he made a solemn entry into Frankfort, and was crowned by his brother, the Elector of Cologne. But fortune soon deserted him. The armies of Maria Theresa reconquered all Upper Austria, and overwhelmed Bavaria. It was necessary to abandon Bohemia. Charles fled to Frankfort, and convoked a diet, when an attack of the king of Prussia on Maria Theresa allowed him to return to Munich in 1744. He was succeeded in the electorate by his son Maximilian Joseph, in the imperial dignity by Francis I., husband of Maria Theresa.

Charles I. of Anjou, king of Naples, the son of Louis VIII. of France: b. about 1220; d. Foggia 7 Jan. 1282. He waged war on King Manfred of Sicily, and having defeated him, seized on the Neapolitan crown in 1266. His cruelty and exacting rule induced such a detestation of the French name, that the Sicilians, headed by John de Procida, rose in arms on the eve before Easter Day, 1282, and slaughtered all the French in the town and neighborhood of Palermo, the signal for rising being the tolling of the vesper-bell; this tragedy is hence recorded in history as the "Sicilian Vespers" (q.v.). By this act the French were entirely expelled from the island.

Charles I., king of Portugal: b. 28 Sept. 1863. He is the son of Luiz I. and of Maria, the daughter of Victor Emmanuel II. of Italy, and came to the throne 19 Oct. 1889. Since that event a powerful radical element has made itself felt in Portugal. The country has, however, become of more importance than for some time previous owing to the progress that Portuguese colonization has lately been making in east Africa.

Charles I., Karl Eitel Friedrich Zephym Ludwig (of HOHENZOLLERN SIGMARINGEN), king of Rumania: b. Germany 20 April 1839. The second son of Prince Karl of Hohenzollern, he entered the Prussian army early and held the

CHARLES

rank of lieutenant of dragoons when, at the suggestion of the Prussian ambassador, he was elected Prince of Rumania 10 May 1866. He subsequently proclaimed Rumania independent of Turkey and was declared king 26 March 1881. He was married in 1869 to Princess Elizabeth von Neuwied, who as "Carmen Sylva" (q.v.) is well known as an author.

Charles Albert, king of Sardinia: b. 2 Oct. 1798; d. Oporto, Portugal, 28 July 1849. He was the son of Charles Emmanuel, prince of Savoy-Carignan. He was educated in France, and in 1831 succeeded to the throne as the nearest heir on the death of Charles Felix, and in the first years of his reign showed himself favorable to the cause of progress by promoting a number of beneficial reforms. Subsequently, indeed, he became more absolute in his views, but after the French revolution of February 1848 he granted the nation a constitution, and took the field against Austria on behalf of the revolted peoples of the Lombardo-Venetian kingdom and the duchies of central Italy. His arms were at first very successful, defeating the Austrians in various encounters, but he was at last repulsed by Marshal Radetzky, and obliged to apply for an armistice. On its expiration he resumed hostilities, but only to endure reverses. The battle of Novara, fought on 23 March 1849, proved fatal to the aspirations of Charles Albert and Sardinia. That very day he abdicated in favor of his son, Victor Emmanuel II., afterward king of Italy, and retired to Oporto, in Portugal.

Charles I., king of Spain. See CHARLES V., emperor of Germany.

Charles II., king of Spain: b. 6 Nov. 1661; d. 1 Nov. 1700. He succeeded his father, Philip IV., in 1665. In this reign, Spain, which for nearly three centuries had held the foremost rank in Europe as a great military nation, reached the highest point of its greatness, and began rapidly to decline both in influence and glory, but such was the prestige attached to its name and past history, that it had long become powerless before it ceased to be respected. Charles died in 1700, bequeathing his throne to the Duke d'Anjou, grandson of Louis XIV. of France, an act which led to the long and calamitous "War of the Spanish Succession."

Charles IV., king of Spain: b. Naples 12 Nov. 1748; d. there 19 Jan. 1819. He came to Madrid in 1759, when his father, Charles III., after the death of his brother, Ferdinand VI., ascended the Spanish throne, and succeeded him, 13 Dec. 1788. He was married to the Princess of Parma, Louisa Maria. Too imbecile to govern, he was always ruled by his wife and his ministers, among whom the Prince of Peace, Godoy, Duke of Alcudia, from the year 1792, had unbounded influence over him. The hatred which this favorite drew on himself from the Prince of Austrias and other grandees brought on a revolution in 1808, which enabled Napoleon to dethrone the Bourbons. Charles abdicated at Aranjuez, 19 March, revoked this abdication, and finally ceded, at Bayonne, his right to the throne of Napoleon, who settled on him for life the palace of Compiègne and a pension of 6,000,000 francs. Charles after this lived at Compiègne with the queen and her paramour the Prince of Peace, but subsequently exchanged this residence for Rome, where the climate was

more congenial to him. From 1815 he occupied the palace Barberini in this city. Hunting he always made his principal employment.

Charles IX., king of Sweden: b. 5 Oct. 1550; d. Nyköping 30 Oct. 1611. He was the fourth son of Gustavus Vasa and was chosen king in 1604. He fostered trade and mining, and established the University of Gothenburg, at the same time that he was subduing the turbulent nobles of the realm and forming alliances with the Protestant princes of Pennany.

Charles X., king of Sweden: b. Nyköping 8 Nov. 1622; d. Gothenburg 13 Feb. 1660. He succeeded his cousin, Christina, in 1654, and by his prudence and valor considerably extended his dominions, wresting Livonia from the Poles, and several provinces from the crown of Denmark. After a short reign of six years, in which he was constantly engaged in war, sometimes meeting with severe reverses, but, on the whole, a considerable gainer, he was fatally attacked with an epidemic disease then raging among his troops, and was succeeded by his son Charles.

Charles XI., king of Sweden: b. 25 Dec. 1655; d. Stockholm 15 April 1697. He succeeded to the throne at five years of age, but the country was governed by a regency till 1672. He then put in force a system of tyrannous exaction and arbitrary oppression, by which he in a short time made himself absolute. Having once become independent of the states, he studied to appease the people by ruling with justice and impartiality. In war he was unsuccessful, and lost much of his father's territorial acquisitions. He founded the University of Lund, reorganized the army and navy and strengthened the fortresses of the country.

Charles XII., king of Sweden: b. Stockholm 27 June 1682; d. Frederikshall, 30 Nov. 1718. He was well instructed in the languages, history, geography, and mathematics. Curtius' 'History of Alexander' was his favorite book. On the death of his father, in 1697, he was declared of age by the estates. Meanwhile the young king showed but little inclination for business: he loved violent bodily exercises, and especially the chase of the bear. To his jealous neighbors this seemed a favorable time to humble the pride of Sweden. Frederick IV. of Denmark, Augustus II. of Poland, and the Czar Peter I. of Russia therefore concluded an alliance which resulted in the northern war. The Danish troops first invaded the territory of the Duke of Holstein-Gottorp. Charles proposed in the Council of State the most energetic measures against Denmark, the result of which was the discomfiture of the Danes, while the Duke of Holstein was confirmed in all the rights of which it had been attempted to deprive him. Thus ended the first enterprise of Charles XII., in which he exhibited as much intelligence and courage as disinterestedness. He adopted at this time that severe and temperate mode of life to which he ever remained true, avoiding relaxation and useless amusements; wine was banished from his table; at times coarse bread was his only food; he often slept in his cloak on the ground; he generally wore a blue coat, with copper buttons, large boots reaching above his knees, and gloves of buffalo skin.

After thus checking Denmark the attacks of Augustus and Peter were to be repelled. The

CHARLES

former was besieging Riga, the latter menaced Narva and the country situated about the Gulf of Finland. Without returning to his capital, which in fact he never revisited, Charles caused 20,000 men to be transported to Livonia, and went to meet the Russians, whom he found 80,000 strong in a fortified camp under the walls of Narva. On 30 Nov. 1700, between 8,000 and 10,000 Swedes placed themselves in order of battle, under the fire of the Russians, and the engagement began. In less than a quarter of an hour the Russian camp was taken by storm. Thirty thousand Russians perished on the field or threw themselves into the Narva; the rest were taken prisoners or dispersed. After this victory Charles crossed the Dwina, attacked the intrenchments of the Saxons, and gained a decisive victory.

The war continued: the Swedes gained a brilliant victory at Clissau; in 1703 all Poland was in the possession of the conquerors. At Altranstadt he dictated the conditions of peace in 1706. The Livonian Patkul, who was the prime mover of the alliance against Sweden (at that time Peter's ambassador in Dresden), was delivered up to him on his demand, and was broken on the wheel. It might well cause general astonishment that a prince, till then so magnanimous, could stoop to such intemperate revenge. In other respects Charles exhibited, during his stay in Saxony, moderation and magnanimity.

In September 1707 the Swedes left Saxony. They were 43,000 strong, well clothed, well disciplined, and enriched by the contributions imposed on the conquered. Six thousand men remained for the protection of the king of Poland; with the rest of the army Charles took the shortest route to Moscow. But having reached the region of Smolensk he altered his plan, at the suggestion of the Cossack hetman Mazeppa, and proceeded to the Ukraine, in the hope that the Cossacks would join him. But Peter laid waste their country, and the proscribed Mazeppa could not procure the promised aid. The difficult marches, the want of provisions, the perpetual attacks of the enemy, and the severe cold, weakened Charles' army in an uncommon degree. Pultawa, abundantly furnished with stores, was about to be invested when Peter appeared with 70,000 men. Charles, in reconnoitering, was dangerously wounded in the thigh; consequently, in the battle of 8 July 1709, which changed the fortunes of the Swedish hero and the fate of the North, he was obliged to issue his commands from a litter, without being able to encourage his soldiers by his presence. They were obliged to yield to superior force, and the enemy obtained a complete victory. Charles saw his generals, his favorite minister, Count Piper, and the flower of his army, fall into the power of those Russians so easily vanquished at Narva. He himself, together with Mazeppa, fled with a small guard, and was obliged, notwithstanding the pain of his wounds, to go several miles on foot. He finally found refuge and an honorable reception at Bender, in the Turkish territory. The regency in Stockholm took measures for the defense of the Swedish territory. Gen. Steinbock assembled a body of militia and peasants, defeated the Danes at Helsingborg, and compelled them to evacuate Schonon. Several divisions were sent to Finland to keep off the

Russians, who nevertheless advanced, being superior in numbers. Charles, meanwhile, negotiated at Bender with the Porte; succeeded in removing the ministers who were opposed to him, and induced the Turks to declare war against Russia. The armies met on the banks of the river Pruth, 1 July 1711. Peter seemed nearly ruined when the courage and prudence of his wife produced a peace, in which the interests of Charles were entirely neglected. This monarch, however, projected at Bender new plans, and through his agents solicited of the Porte auxiliaries against his enemies. But the Russian agents were no less active to prepossess the Porte against him, pretending that Charles designed to make himself, in the person of Stanislaus, the actual master of Poland, in order from thence, in connection with the German emperor, to attack the Turks. The seraskier of Bender was ordered to compel the king to depart, and in case he refused, to bring him, living or dead, to Adrianople. Little used to obey the will of another, and apprehensive of being given up to his enemies, Charles resolved to defy the forces of the Porte with the 200 or 300 men of which his retinue consisted, and sword in hand, to await his fate. When his residence at Varnitza, near Bender, was attacked by the Turks he defended it against a whole army, and yielded only step by step. The house took fire, and he was about to abandon it when, his spurs becoming entangled, he fell and was taken prisoner. The Turks now removed their prisoner from Bender to Demotica, near Adrianople. Escaping in disguise he reached Stralsund on the night of 22 Nov. 1714. A combined army of Danes, Saxons, Russians, and Prussians immediately invested Stralsund. Charles performed, during the defense, miracles of bravery. But being obliged to surrender the fortress, on 23 Dec. 1715, he proceeded to Lund, in Schonon, and took measures to secure the coast. He then attacked Norway. The Baron of Görtz, whose bold but intelligent plans were adapted to the situation of the Swedish monarchy, was at that time his confidential friend. His advice was, that Charles should gain Peter the Great to the interest of Sweden by important concessions, make himself master of Norway, and from thence land in Scotland, in order to dethrone George I., who had declared himself against Charles. Görtz discovered resources for prosecuting the war, and entered into negotiations at Aland with the plenipotentiaries of the czar. Peter was already gained and a part of Norway conquered; the fortunes of Sweden seemed to assume a favorable aspect; Charles was besieging Frederikshall, when, on 30 Nov. 1718, as he was in the trenches, leaning against the parapet and examining the workmen, he was struck on the head by a cannon-ball. He was found dead in the same position, his hand on his sword, in his pocket the portrait of Gustavus Adolphus and a prayer-book.

At Charles' death Sweden sank from the rank of a leading power. In his last years he had formed great plans for the improvement of its navy, trade, and commerce. At Lund he often conversed with the professors of the university, and attended public disputations on geometry, mechanics, and history. In Bender, the reading of useful books was one of his principal employments: he sent for Swedish scholars, and caused them to travel through

CHARLES — CHARLES THE BOLD

Greece and Asia. Accounts of some of these travels have been printed; there are others in manuscript at Upsal. Firmness, valor, and love of justice were the grand features of Charles' character, but were disfigured by an obstinate rashness. After his return he showed himself more peaceable, gentle, moderate, and disposed to politic measures. Posterity, considering him in relation to his times, will say that he had great virtues and great faults; that he was seduced by prosperity, but not overcome by adversity.

Charles XII., *The History of*, a famous work by Voltaire, published in 1731. It is divided into eight books, and is considered its author's historical masterpiece.

Charles XIII., king of Sweden: b. 7 Oct. 1748; d. 5 Feb. 1818. He was the second son of King Adolphus Frederick. Having been appointed at his birth high-admiral of Sweden, his education was directed chiefly to the learning of naval tactics, for which purpose he engaged in several cruises in the Cattegat. In 1765 he became honorary president of the Society of Sciences at Upsal. In 1770 he commenced the tour of Europe. The death of Adolphus Frederick recalled him to Sweden, where he took an important part in the revolution of 1772. His brother, Gustavus III., appointed him governor-general of Stockholm, and Duke of Sudermannland. In the war with Russia, in 1788, he received the command of the fleet, defeated the Russians in the Gulf of Finland, and, in the most dangerous season of the year, brought back his fleet in safety to the harbor of Carlsrona, after which he was appointed governor-general of Finland. After the murder of Gustavus III., in 1792, he was placed at the head of the regency, and, happily for Sweden, preserved the country at peace with all other nations, while he united with Denmark for the protection of the navigation in the northern seas. In 1796 he resigned the government to Gustavus Adolphus IV., who had become of age, and retired to his castle of Rosersberg. He did not again appear in public life till a revolution hurled Gustavus Adolphus IV., in 1809, from the throne, and placed Charles at the head of the state, as administrator of the realm, and some months afterward, 20 June 1809, as king of Sweden, at a very critical period. The peace with Russia, at Frederiksham, 17 Sept. 1809, gave the country the tranquillity necessary for repairing its heavy losses, and for completing the constitution. He had already adopted Prince Christian of Holstein-Sonderburg-Augustenburg as his successor, and after his death, Marshal Bernadotte, who was elected by the estates, in August 1810, to take the place of the prince. On him he bestowed his entire confidence. His prudent conduct in the war between France and Russia in 1812 procured Sweden an indemnification for Finland by the acquisition of Norway 4 Nov. 1814. Although some disappointed nobles may have given utterance to murmurs against his government, Charles XIII. nevertheless enjoyed the love of his people till his death.

Charles XIV., king of Sweden. See **BERNADOTTE, JEAN BAPTISTE JULES**.

Charles XV. (**LOUIS EUGÈNE**), king of Sweden and Norway: b. 3 May 1826; d. 18 Sept. 1872. He was the son of Oscar I., whom he succeeded 8 July 1859. In his reign the Storth-

ing, or parliament, was reconstituted and given a more representative character. He was the author of a book of poems.

Charles, archduke of Austria, third son of the Emperor Leopold II.: b. Florence 5 Sept. 1771; d. 30 April 1847. In his 20th year he distinguished himself in the battles of Jemappes and Neerwinden, in both of which the French republican armies were beaten, and was appointed governor-general of Belgium in 1793. Appointed in 1796 field-marshal of the empire and commander-in-chief of the Austrian army on the Rhine, he opened the campaign by the victory of Neumarkt over Jourdan, which were quickly followed by the successes of Teining and Amberg, which compelled Moreau to make his memorable retreat. In the winter of 1797 he captured Kehl, the only position the French occupied in Germany. After the fruitless congress at Rastadt he put himself at the head of the Rhine army, and again defeated his old opponent Jourdan at Ostrach and Stockach. Misunderstandings that arose between him and the Russian generals, Suwarow and Korsakow, and his weak state of health, compelled him to throw up his command and retire to Bohemia. In the protracted struggle in the heart of Germany Napoleon's genius was on every occasion triumphant, once only, at Aspern, did Charles snatch a victory from him, but the battle of Wagram laid Austria at the feet of the French emperor.

Charles, 1st Duke of Lorraine: b. 953; d. Orleans 994. He early succeeded to his paternal inheritance. No sooner, however, was he invested with sovereign power, than he laid claim to the crown of France, on the death of Louis V., and immediately endeavored to sustain his claim by force of arms; but in the first battle fought between the two powers, was made prisoner, his army entirely defeated, and himself cast into a dungeon in the gloomy castle of Orleans, where he died a prisoner, 994.

Charles Augustus, Grand Duke of Saxe-Weimar: b. 3 Sept. 1757; d. Graditz, Prussia, 14 June 1828. He succeeded to power in 1775, was a general in the army of Prussia 1772-93, and with the allies opposed Napoleon 1813-15. By the Congress of Vienna his principality was made a grand duchy. He liberally patronized science and art, and under him his capital of Weimar became the literary centre of Germany. He was a close friend of Goethe.

Charles the Bald. See **CHARLES I. of France**.

Charles the Bold, Duke of Burgundy: b. Dijon 10 Nov. 1433; d. Nancy 5 Jan. 1477. He succeeded to the dukedom in 1467, and immediately engaged in a war with the citizens of Liège, whom he conquered and treated with extreme severity. Before this undertaking he had been obliged to restore to the citizens of Ghent the privileges which had been taken from them by Philip the Good. He now revoked his forced concessions, caused the leaders of the insurrection to be executed, and imposed a large fine on the city. In 1468 he married Margaret of York, sister of the king of England. Learning that the inhabitants of Liège, instigated by the king, Louis XI., had rebelled anew, and made themselves masters of Tongres, he compelled the king to sign a treaty, the most disgraceful condition

CHARLES EDWARD STUART—CHARLES EMMANUEL

of which was that he should march with Charles against the city of Liége, which he had himself excited against the Duke. Charles encamped before Liége in company with the king; the city was taken by storm, and abandoned to the fury of the soldiers. Such success rendered the mind of the Duke utterly obdurate, and added the last traits of that inflexible sanguinary character which made him the scourge of his neighborhood, and led to his own destruction. Edward IV. conferred on him in 1470 the Order of the Garter. Shortly after he received in Flanders Edward himself, who came to seek an asylum with the Duke. Charles gave him money and ships to return to England.

About the end of the same year the war between the king of France and the Duke of Burgundy was renewed, and never did Charles show himself more deserving of the name of the "Bold" or "Rash," than in this war.

Having completed the conquest of Lorraine by the taking of Nancy in 1475, he turned his arms against the Swiss; and notwithstanding the representations of these peaceful mountaineers, who told him that all that he could find among them would not be worth so much as the spurs of his horsemen, he took the city of Granson, and put to the sword 800 men, by whom it was defended. But these cruelties were soon avenged by the signal victory which the Swiss obtained near the same city 3 March 1476.

With a new army he returned to Switzerland, and lost the battle of Murten (Morat) 22 June. The Duke of Lorraine, who had fought in the army of the Swiss, led the victors to the walls of Nancy, which surrendered 6 October. At the first information of this siege Charles marched to Lorraine, to retake the city of Nancy from the Duke René. On 5 or 6 January 1477 the two armies met: the wings of the Burgundian army were broken through and dispersed, and the centre, commanded by the Duke in person, was attacked in front and flank. As Charles was putting on his helmet, the gilded lion which formed its crest fell to the ground, and he exclaimed with surprise, *Ecce magnum signum Dei!* Defeated, and carried along with the current of fugitives, he fell, with his horse, into a ditch, where he was killed by the thrust of a lance. His body, covered with blood and mire, and with the head imbedded in the ice, was not found till two days after the battle, when it was so disfigured that for some time his own brothers did not recognize it. See Kirk, 'History of Charles the Bold' (1863-8). In 'Quentin Durward,' Sir Walter Scott has portrayed the character of Charles, and some of the quarrels between him and Louis of France.

Charles Edward Stuart (THE YOUNG PRETENDER), grandson of James II., king of England: b. Rome 31 Dec. 1720; d. there 31 Jan. 1788. From the cradle he was inspired with an impulse that induced him to attempt the recovery of the throne of his ancestors. With borrowed money, and seven trusty officers, he landed, 28 July 1745, at Lochnanuadh, Scotland, from a ship of 18 guns called the *Doutelle*, which contained arms for 1,500 men. He found so many adherents among the discontented Scottish nobles, who went over to his party together with the Highlanders under them, that he was soon at the head of a little army. With this he conquered the British troops which advanced to

meet him from Edinburgh, captured Perth, and caused himself to be proclaimed regent of England, Scotland, and Ireland. He also took Edinburgh, 17 Sept. 1745, where he was once more proclaimed regent, and surrounded with his ministers and generals. On 22 Sept. 1745 he defeated at Prestonpans an army of 4,000 British under Sir John Cope. He set the prisoners at liberty. His force was now 7,000 strong. With this he advanced, and laid siege to Carlisle, 15 November, which, after three days, surrendered and supplied him with a great number of arms.

He now caused his father to be proclaimed king, and himself regent of England; removed his headquarters to Manchester, and soon found himself within 100 miles of London, where many of his friends awaited his arrival. The rapid successes of the adventurer made the British government tremble; and a part of the British forces in Germany was recalled. Want of support, disunion, and jealousy among his adherents of the house of Stuart, and the superior force opposed to him, compelled Prince Charles to retire in the beginning of 1746. The victory at Falkirk, 28 Jan. 1746, was his last. As a final attempt he risked the battle of Culloden, against the Duke of Cumberland, 16 April 1746, in which his army was defeated and entirely dispersed. The prince now wandered for a long time through the wilds of Scotland, often without food, and the price of £30,000 sterling was set on his head. Once, when fairly surrounded by enemies, he succeeded in escaping by the devotion and courage of Flora McDonald. On 20 Sept. 1746, five months after the defeat of Culloden, he sailed from Scotland, and arrived in France destitute of everything. By the interest of Madame de Pompadour Charles now received an annual pension of 200,000 livres for life; he had also 12,000 doubloons yearly from Spain.

The Peace of Aix-la-Chapelle in 1748 deprived him of all prospects of recovering the throne of Great Britain. He went to Rome, the residence of his father, James III.; but his relations to the Roman court were changed after his father's death 1 Jan. 1766. His often ridiculous requests in regard to the etiquette to be observed toward him, which he made under the name of Count of Albany, rendered his presence troublesome. He went to Florence till Pius VI. recalled him to Rome by withdrawing his pension. That his family might not become extinct, he married in the 52d year of his age, 17 April 1772, a princess of Stolberg-Gedern; but his violence led to a separation in 1780. He now became addicted to intoxication. He died 31 Jan. 1788, in the 68th year of his life. Three years before he sent for his natural daughter from France, legitimated her, and declared her, on his royal authority, his lawful heiress, under the title of Countess of Albany. His body was carried to Frascati, and entombed in a style worthy of a king. A sceptre, crown, sword, and the escutcheons of England and Scotland adorned his coffin; and his only brother then living, the Cardinal of York, performed the funeral services for "dead King Charles." The Cardinal of York received a pension from Great Britain after 1799, and died in Frascati 13 July 1807.

Charles Emmanuel I., Duke of Savoy, surnamed "the Great": b. Rivoli 12 Jan. 1562; d. Savillan 26 July 1630. He formed (1590) the plan

CHARLES THE FAIR — CHARLESTON

of uniting Provence to his dominions. Philip II. of Spain, his father-in-law, obliged the parliament of Aix to acknowledge him as the protector of this province, in order by this example to induce France to acknowledge the king of Spain as protector of the whole realm. The Duke of Savoy, not less ambitious, likewise aimed at this crown, and after the death of Matthias desired also to be chosen emperor of Germany. He likewise intended to conquer the kingdom of Cyprus, and to take possession of Macedonia, the inhabitants of which, oppressed by the Turks, offered him the sovereignty over their country. The citizens of Geneva were obliged to defend their city in 1602 against this ambitious prince, who fell upon them by night in time of peace. Henry IV., who had reason to complain of the Duke, and whose general, the Duke of Lesdiguières, had beaten Charles Emmanuel several times, entered at last into a treaty of peace with him, not disadvantageous to the Duke of Savoy; but he could not remain quiet, and began again a war with France, Spain, and Germany.

Charles the Fair. See CHARLES IV. of France.

Charles the Fat. See CHARLES II. of France.

Charles Friedrich August Wilhelm, Duke of Brunswick: b. 30 Oct. 1804; d. 1873. He succeeded to the dukedom in 1823, but his rule was so arbitrary and oppressive that the German Diet deposed him. He subsequently lived in Paris and London, and at his death bequeathed his vast fortune to the city of Geneva.

Charles d'Orleans, shär'l'dor-lā-än', French nobleman and poet, son of Louis d'Orléans: b. 26 May 1391; d. 4 Jan. 1465. He was the grandson of Charles V. of France, and the father of Louis XII. He was taken prisoner at Agincourt, and kept in captivity in England from 1415 to 1440, when he was ransomed. He wrote a number of lyrics while in prison and after his return to France. At Blois, where he held his court, he gathered together the chief French writers of his time, and took part with them in poetical tournaments, in one of which François Villon competed successfully. He has been termed the father of French lyric poetry, but has no claim to the title. His light and graceful lyrics are the last flowering of the courtly poetry of the Middle Ages; they show no trace of the modern spirit which appears so strongly in the works of his contemporary, Villon. His favorite themes are love and the springtime; his favorite form is the rondel, with two rhymes, of which he is considered the chief master, as Villon is of the ballade, and Voiture of the rondeau.

Charles the Simple. See CHARLES III. of France.

Charles the Wise. See CHARLES V. of France.

Charles, Elizabeth Rundle, English writer of religious stories: b. 1826; d. London 28 March 1896. She was married to Andrew Charles in 1851. Her books have been widely popular in England and America, the most famous of them being 'The Chronicles of the Schonberg-Cotta Family' (1863). Among her other works are: 'Diary of Miss Kittie Trevelyan' (1864); 'The Draytons and Davenants' (1866); 'Winifred Bertram' (1866);

'Martyrs of Spain' (1870); 'Against the Stream' (1873); 'The Bertram Family' (1876); 'Lapsed But Not Lost' (1881).

Charles, Jacques Alexander César, French scientist: b. Beaugency, France, 12 Nov. 1746; d. 7 April 1823. He lectured on physical science in Paris and in 1783 made with M. Robert the first ascent ever made in a balloon. A height of 7,000 feet was reached on this occasion.

Charles, R. H., Irish theologian and scholar: b. County Tyrone 6 Aug. 1855. He was educated at Queen's College, Belfast, and Trinity College, Dublin, and was admitted to the Anglican priesthood in 1883. He was curate of St. Mark's, Whitechapel, 1883-5; of St. Philip's, Kensington, 1885-6; and of St. Mark's, Kennington, 1886-9. Since 1898 he has been professor of biblical Greek at Trinity College, Dublin. He has published 'Forgiveness, and Other Sermons' (1886); 'Book of Enoch Translated From the Ethiopic' (1893); 'Ethiopic Text of Book of Jubilees' (1894); 'Book of the Secrets of Enoch' (1895); 'The Assumption of Moses' (1897), etc.

Charles Grandison, The History of, the title of an extremely prolix novel by Samuel Richardson, published in 1753.

Charles City, Iowa, a city and county-seat of Floyd County, on Cedar River, and on the Illinois Cent., and the Chicago, M. & St. P. R.R.'s. It is supplied with good water-power by the river and has a number of manufacturing interests. It is the seat of Charles City College, a co-educational institution, organized in 1891, under the auspices of the German Methodist Church, which had 246 students at the end of 1901. Pop. 4,227.

Charles City Cross-roads, Battle of. See GLENDALE, BATTLE OF.

Charles River, a river in Massachusetts, which flows into Boston harbor, dividing Boston from Charlestown. The source of the principal branch is a pond bordering on Hopkinton. It is navigable for lighters and large boats to Watertown, seven miles west of Boston.

Charles's Wain, a common name for the constellation of the Great Bear or Ursa Major. Originally instead of Charles's Wain, the name was "carl's" or "churl's wain," meaning the farmer's wagon. Since the time of Homer this constellation has been called a wagon; but since the 17th century the name has been associated with Charles I. and Charles II. Shakespeare calls it Charles's Wain.

Charleston, chär'lz'tön, Ill., county-seat of Coles County, situated at the junction of the Cleveland, C. C. & S. L. and the Toledo, S. L. & K. C. R.R.'s, 49 miles southeast of Decatur. It has manufactories of woolen goods, carriages, stoves, plows, brooms, and also flour-mills, banks, good schools, and several churches. Pop. (1900) 5,488.

Charleston, S. C., the chief city of the State, and largest on the Atlantic seaboard south of Chesapeake Bay, seat of Charleston County; on the Atlantic C. L. and Southern R.R. (Charleston & S. and South C. & Georgia) systems; 130 miles southeast of Columbia, the capital, and 82 miles north of Savannah. Pop. (1900) 55,807, over half colored.

CHARLESTON

Charleston lies on a peninsula, 10 or 12 miles long and 8 or 10 feet above high water, between the navigable Ashley and Cooper rivers, 2,100 yards and 1,400 yards wide respectively at the mouth; the latter reinforced by the Wando at the city, and the estuary of the three forming a magnificent landlocked harbor, six miles long by three wide, with 40 feet of water at the city,—one of the finest on the Atlantic coast.

The government jetties have scoured a channel across the bar to a mean depth already of 26 feet at low water, or 31 feet at mean high tide, which it is believed will be soon increased by several feet. There are about nine miles of available water front, most of the wharfage being on the Cooper, which is navigable 30 miles to the canal connecting it with the Santee, and so with the west and northwest of the State. Ocean traffic has been quick to follow the favorable new channel opened for it; besides the Clyde Line of steamships, which taps the Atlantic ports from Boston to Jacksonville, and includes Charleston, two ocean freight lines, in 1901, established terminal docks at the city, one to the West Indies and Central America. The prospects for a large commerce with those regions are favorable, Charleston as a distributing port saving the passage around Cape Hatteras out through the Gulf. The resemblance of the city's position to that of New York in its rivers and harbor is striking, and freight here is moved directly from vessel to freight cars, or *vice versa*, without lightering or trucking. The distances from the central West are also favorable, and for the first time in its history Charleston seems entering on a period of rapid growth. The government is aiding in this by its great new navy-yard projects. The naval station has been moved to Charleston, where a tract on the Cooper River about seven miles from the city has been bought; the plans contemplate an outlay of \$8,000,000 to \$10,000,000, and it will certainly not be less. The harbor is defended by the historic Fort Moultrie, at Sullivan's Island on the eastern side, which the government is improving into one of the best equipped defenses on the coast at a cost of some \$500,000; by Fort Sumter on a small island in the centre; and batteries Sergeant Jasper (from a Revolutionary hero) and Capron. Fort Wagner, Fort Ripley, and Castle Pinckney, once celebrated, are now abandoned.

Trade and Commerce.—The Civil War nearly ruined Charleston's commerce, which consisted mainly in exports of cotton (it stood third in the United States, next to New York and New Orleans), rice, and naval stores, to the amount of some \$17,000,000 at the time of the War. The silting up of docks, decay of wharves, and destruction of railroads, were repaired slowly, and the commerce which had found new outlets was reclaimed; the total in 1901 being but \$7,084,215, of which \$6,728,665 was cotton, the remainder being cotton goods, rice, naval stores, and turpentine casks, lumber, phosphate fertilizers, fruits and vegetables. Charleston has a very valuable staple in the Sea Island cotton, with its long fibre, which grows in most perfection on the islands near the city; the raising of fruits and early vege-

tables for Northern markets also relies on Charleston's shipping facilities.

Manufactures.—The great manufacture of Charleston is fertilizers, from the inexhaustible beds of phosphate rock in the vicinity, discovered by Dr. St. Julien Ravenel some time after the War: out of a total manufactured product valued at \$9,562,387 in 1900, \$3,967,090 was of phosphates, none other amounting to \$500,000. From May 1901 to May 1902, the shipment of manufactured fertilizers was 296,646 carloads; there were 11 establishments, with a capital embarked of \$7,868,639, employing 1,409 people besides stockholders, paying \$488,842 in wages and salaries, and \$2,238,615 for materials. Of the other industries, besides domestic and jobbing ones, like food, clothing, plumbing, etc., the chief were of tobacco products, foundry and machine-shop work, cotton compressing, and oil and rice milling, bagging factories, cigar factories; making baskets to ship fruit and vegetables in, and casks for turpentine; ice, soap, beer, and mineral waters.

Interior, Buildings, Suburbs, etc.—Charleston's long existence for an American city, and its position of leadership in all political movements as well as vital importance in war time, give it much historical interest; and its old garden-set mansions and surroundings are often of great beauty in themselves. It is laid out generally at right angles, but with some picturesque irregularities in the streets; four of these, King Street, the principal retail thoroughfare; Meeting Street; and Rutledge and Ashley avenues, run the entire length of the city, north and south. King Street ends in White Point Garden, a handsome wooded park containing monuments to Sergeant John Jasper and William Gilmore Sims; east of this is the Battery, a broad esplanade 1,500 feet long, affording a noble view of the harbor and the forts. At the junction of Broad and Meeting streets are grouped the public buildings, consisting of the court-house, a solid brick building; the city hall, an imposing structure entered by a double flight of steps, and containing a historical museum with valuable relics; and the new post-office, a magnificent four-story building of Carolina granite, with a tower and all modern appliances, costing about \$500,000. The United States custom-house, near Market wharf on the Cooper River, is a superb structure of white marble, costing some \$3,000,000. In front of the city hall is Washington Park, containing two handsome fountains and a statue of William Pitt, erected before the Revolution—the British shot off one of the arms in 1780. There are monuments also to the Confederate dead and to John C. Calhoun, and a bust of Henry Timrod, the poet.

The Ashley is crossed by two bridges: that of the Charleston & S. R.R., and a toll-bridge known as the "New Bridge." Charleston has one of the best electric street railways in the country, having some 30 miles of track within the city limits, connecting with Chicora Park, about four miles from the city, on the Cooper, and with the Isle of Palms, a magnificent seaside resort about 10 miles north of the harbor. It also runs to the suburb of Mount Pleasant, across the Cooper, and eastern side of the harbor, and to Sullivan's Island, about

CHARLESTON

three miles off, where is a fine bathing beach. Magnolia Gardens, 12 miles west on the Ashley, is a popular summer resort, but the chief one is Summerville, 22 miles northwest, with a dry, cool climate. Of the open spaces near the city, Magnolia Cemetery at the north end, beautifully kept with flowers and shrubs, and with many fine monuments, is the chief. The city has a complete system of tidal drainage, and is in excellent sanitary condition.

Education.—The public-school system, established in 1810, had in 1902, six school buildings, about 100 teachers, and a total attendance of about 7,750, 4,200 colored; besides some 800 in private and parish schools. For higher education, the chief institutions are Charleston College, chartered in 1785, with a museum of natural history and a library; the South Carolina Military Academy, a State institution, established in 1843, one of the foremost military schools in the country, and famed for the active part its students took in the Civil War; Porter Military Academy, including Porter Manual Training Institute; the State Medical College, chartered in 1852; the Charleston and Memminger High Schools; the Academy of Our Lady of Mercy; Smith's School for Young Ladies; University School; and the Avery Normal Institute and the Wallingford Academy for Colored Youth.

Churches and Charitable Institutions.—There are over 60 churches in Charleston, the leading denominations being the Protestant Episcopal and the Presbyterian. It is a Roman Catholic bishop's see, and has a cathedral, St. Finbar's, rebuilt in 1890. The oldest church building is St. Michael's (P. E.), dating from 1761, with a fine chime, of interesting history; the oldest organization, however, is St. Philip's (P. E.), whose building was burned in the great fire of 1835, and whose present one is a classic structure of great beauty and originality, with a steeple nearly 200 feet high, bearing at night a beacon, visible far out at sea; and with a churchyard full of distinguished names, including Calhoun, Gadsden, Rutledge, and Pinckney. The Circular Church (Congregational) is also noted; among others of interest are: Grace (P. E.), the Scotch, the Second, and Westminster (Presbyterian), Citadel Square (Baptist), the Old Huguenot, Unitarian, Bethel, and Trinity Methodist, and the Hebrew Synagogue. Of the charitable institutions, the most important are the Orphan House, founded in 1792, the oldest of its kind in the United States; the Euston Home for the Aged; Home for Mothers, Widows and Daughters of Confederate Soldiers; the City and the Roper hospitals; the almshouse; and the Old Folks' Home for Aged Colored People. Among charitable societies are St. Andrew's Society, founded by Scotchmen in 1720, the oldest society in the city; and the South Carolina Society, founded by Huguenots in 1736,—renamed from the Two-Bit Club, so called from the sum contributed by each member at each meeting for the relief of their own indigent.

Banks.—In 1900 there were 3 national and 13 savings and State banks, with an aggregate capital and surplus of over \$2,700,000. There were also 14 building and loan associations in

active operation, with aggregate capital amounting to about \$1,500,000.

Government and Finances.—The government is, by the charter of 1836: a four-years' mayor and a council elected half by wards and half at large. The administrative boards and officials are partly appointive by the mayor and partly elective by the council. The city expenses are about \$600,000 a year, of which \$60,000 each goes for schools and charities, \$75,000 for police, and \$50,000 for the fire department. The net debt is about \$3,800,000; the assessed valuation of all taxable property, \$17,300,000, of which \$12,400,000 is real estate; the city tax rate is \$26.50 per \$1,000, besides a school tax of \$1 and a State and county tax of \$10.62½.

Population.—In 1790, the first census, 16,359; 1800, 18,924; 1810, 24,711; 1820, 24,780; 1830, 30,289; 1840, 29,261; 1850, 42,985; 1860, 40,522; 1870, 48,956; 1880, 49,984; 1890, 54,955; 1900, 55,807; of which 31,522 were negro.

History.—The first settlement in South Carolina was made at Port Royal by the French, in 1562; it was not successful, but they never forgot the experiment or their favor for the region. In 1670 an English colony under Gov. William Sayle made for Port Royal also; but on the advice of the cacique of Kiawah (the then name of the Ashley), settled instead at Albemarle Point, on the west bank of the Kiawah, three miles from the present site,—fortunately, as the colony Lord Cardross planted at Port Royal was exterminated by the Spaniards in 1686. The settlement was named Charles Town after Charles II. Within two years the settlers had discovered that Oyster Point, the end of the Charleston peninsula, was a better site, and in 10 the latter had become the main settlement and the offices were removed there. The first village was on the Cooper entirely, as the main business still is. The commerce even at this early date was lively, 16 vessels sometimes discharging at once. In 1685-6 a colony of Huguenot refugees settled there and built a church: this strain has deeply molded Charleston and South Carolina, and its fiery zeal in heading every political movement is perhaps due to this quick French blood. In 1704 there were five churches: St. Philip's, the Huguenot, the First Baptist, a Presbyterian and Congregational meeting-house, and a Quaker one. In August 1706 an allied French and Spanish fleet attacked it, but were driven off by a small improvised fleet under Lieut.-Gov. Rhett; shortly afterward another French vessel, unaware of the others' defeat, came up and landed a party, which was routed with heavy loss, and the survivors, with the ship and the rest of the marines, captured. The city at this time was desolated with yellow fever, but this militia action counts among the brilliant feats of the War of the Succession. In 1755 a colony of 1,200 deported Acadians settled there, still further reinforcing the French element. In 1773, Josiah Quincy of Boston writes in his diary that the town was "beautiful and in many respects magnificent"; and "far surpassed everything he ever saw or expected to see in America." It was at this time the third seaport in size in America, and in 1774 established a chamber of commerce. It

CHARLESTON — CHARLEVOIX

was not only the first Southern city to join the Revolutionary movement, but was the prime agent in bringing about the first provincial congress 10 years before; it held the first constitutional convention in any colony in March 1776, and promulgated an independent constitution. On 28 June the British fleet, under Sir Peter Parker, besieged the city, and was beaten off with terrible loss by the garrison of Fort Moultrie behind an improvised palmetto fortification. In 1779 a second attack under Gen. Augustine Prevost was defeated. But on 12 May 1780 Sir Henry Clinton with 16,000 men captured it and its garrison of 7,000 under Gen. Lincoln, after a six weeks' siege; it was not reoccupied by the Americans till 14 Dec. 1782. In 1783 it was incorporated as a city, and remained the capital of South Carolina till 1790. In 1784 it exported the first bale of cotton sent from the United States to Europe. In 1793 some 500 French refugees from the massacres of San Domingo settled there. It was the heart of the nullification movement in 1832, as of all movements to oppose Federal authority first and last; and the Breckenridge convention of 1860 met here before adjourning to Baltimore. The convention which proclaimed the State's secession from the Union was held here 20 Dec. 1860. The Civil War was begun by its bombardment and capture of Fort Sumter on 12-13 April 1861; and from 7 April 1863 on, for nearly two years, the fort was incessantly besieged and steadily bombarded by the Union fleet, for the last 18 months it being only a heap of ruins, but impregnable. On 17 Feb. 1865, on the surrender of Columbia, Hardee evacuated the city and burned all public buildings, stores, and shipping, and the next day Foster and the union forces took possession. Despite its devastation and wreckage, it grew 21 per cent from 1860 to 1870, while it had fallen off in the previous decade,—a curious phenomenon. In 1886, on 31 August, the heaviest earthquake ever recorded in the United States destroyed several hundred buildings, and made three fourths of the whole uninhabitable, killed scores of people, and caused a property damage estimated at \$8,000,000. On 2 Dec. 1901 the South Carolina Interstate and West Indian Exposition was inaugurated in the city.

(For a compact sketch of its history, see Yates Snowden in Powell's 'Historic Towns of the Southern States'; in connection with State history, McCrady's three volumes of South Carolina history, 1897-1901.)

HENRY TUPPER,
Secretary Chamber of Commerce.

Charleston, W. Va., a city, capital of the State, and county-seat of Kanawha County, at the junction of the Kanawha and Elk rivers, on the Chesapeake & O., the Ohio Cent., and the Charleston, C., and Sutton R.R.'s, 130 miles south by west of Wheeling. It is an important commercial, lumber, and coal-mining centre, with steamer communications with all Ohio and Mississippi River ports. In 1900 it contained 119 manufacturing establishments, valued at \$1,371,807. It has extensive salt springs, State-house, custom-house, hospital and opera house, three national banks, several daily and weekly newspapers, and an assessed property

valuation of over \$4,000,000. Pop. (1900) 11,099.

Charleston Phosphate, a valuable fertilizer obtained at Charleston, S. C., and classed as "land" or "river" phosphate, the latter being procured by dredging. It was discovered in 1837 by Francis S. Holmes, but its value was not demonstrated until 1867. For over 20 years South Carolina was the chief source of the world's supply. In 1888 the phosphate rock was found in Florida, and later in several other States, including North Carolina and Tennessee. In 1897 nearly 1,000,000 tons were mined, of which Florida supplied fully a half, and South Carolina rather less. The river phosphate occurs in nodules washed out of the original Tertiary formations and ranging from a half inch to two feet in diameter. They usually contain 50 to 60 per cent of "bone phosphate." See FERTILIZERS.

Charlestown, Mass., since 1874 a part of the municipality of Boston, previously a separate city and seaport. One of the chief navy yards in the United States, occupying an area of about 100 acres, is in the southeast part of Charlestown. It was settled as early as 1629, and in 1634 became a town, its original territory being considerably larger than at present. It was the scene of stirring events in the Revolutionary War. See BUNKER HILL, BATTLE OF.

Charlestown, South Africa, a town in the extreme north of Natal, on the railway from Durban to Johannesburg. It stands at a height of over 5,300 feet. Majuba Hill is four miles distant.

Charlestown, Va., town and county-seat of Jefferson County; situated on a branch of the Baltimore & O. R.R., 10 miles southwest of Harper's Ferry. It is the centre of an agricultural region, is noted as being the place of trial and execution (2 Dec. 1859), of John Brown (q.v.), and has a national bank, several weekly newspapers, and an assessed property valuation of about \$1,000,000. Pop. (1900) 2,392.

Charlet, Nicolas Toussaint, nĭk-ō-lā too-sāñ shär-lā, French painter and engraver: b. Paris 20 Dec. 1792; d. Paris 29 Oct. 1845. He held a clerkship under the Empire, but lost it at the Restoration (1815), and afterward devoted himself to art. After studying awhile under Gros, he gradually formed for himself a style in which he had no rival. He was especially successful in his sketches of children and military incidents. His drawings numbered about 2,000.

Charleville, shär-lē-vēl, France, a town in the department of Ardennes, on the left bank of the Meuse, opposite Mézières, with which it communicates by a suspension bridge. It is regularly built, has straight, wide, and clean streets, and a public square and fountain, surrounded by arcades, from which the four principal streets diverge. It carries on various industries: and the Meuse affords facilities for a large traffic. Charleville was built in 1606 by Charles, Duke of Nevers and Mantua, and named after himself. Pop. (1891) 17,390.

Charlevoix, Pierre François Xavier de, pē-ār frän-swä ksäv-ē-ā de shär-lē-vwä.

CHARLOCK — CHARM

French Jesuit traveler: b. St. Quentin 29 Oct. 1682; d. La Flèche 1 Feb. 1761. He twice visited Canada, and voyaged down the Mississippi to New Orleans. He published histories of San Domingo, Japan, and Paraguay, a 'History of New France,' and a 'Life of Blessed Mary of the Incarnation.'

Char'lock. See MUSTARD.

Charlotte, shär'löt, N. C., city and county-seat of Mecklenburg County; on Sugar Creek, and on the Southern and Seaboard A. L. R. R.'s; 226 miles northeast of Atlanta, Ga. Electric car lines connect the city with surrounding towns. The city covers an area of about 20 square miles, and its streets are macadamized and lighted with electricity.

Buildings, Churches, Education, etc.—The principal public buildings are the United States post office and courthouse, the assay office, city hall, county courthouse, the Y. M. C. A. and the Y. W. C. A. buildings, the Auditorium, several fine business blocks, and numerous hotels. Nearly all the leading religions are represented, and there are many handsome church edifices. The charitable institutions include Saint Peter's Home and Hospital, a hospital for colored people, Thompson Orphanage, Presbyterian Home for Aged and Helpless Women, the Presbyterian Hospital, Alexander Rescue Home for Children, Negro Orphanage, Crittenton Home, Mercy Hospital (Catholic), and the country home. Beside several public and private schools there are Elizabeth College and Conservatory of Music for young women, Presbyterian College, Saint Mary's Seminary conducted by the Sisters of Mercy, North Carolina Medical College, and Biddle University for colored students. There is also a Carnegie library.

Industries, Finance, etc.—Charlotte is in a fertile agricultural and an extensive cotton growing region; it is the trade centre for Mecklenburg and surrounding counties, and is also the centre of the southern cotton mill industry, having 23 mills, operating 191,266 spindles and 4,326 looms. Within a radius of 100 miles are 360 mills operating 4,744,458 spindles, 110,258 looms, and 2,717 knitting machines. The electrical plants in the vicinity supply light and power for many surrounding cities and towns. There are several gold mines nearby. Manufactures include cotton-milling machinery, cotton-seed-oil and by-products, various kinds of machinery, agricultural implements, fertilizers, pipe, hardware, brick, saddlery and harness, belting, clothing, boots and shoes, drugs, flour, cement and building materials, etc. There are several daily, weekly, and monthly publications. There are four national and one savings banks, two trust companies, and three building and loan associations with combined capitalization of \$4,632,590 and deposits of 5,263,279.20. In 1906 the taxable valuation was \$10,428,980.

Government and History.—The city is divided into 11 wards. The government under the 1907 charter is vested in a mayor and a board of aldermen of 21 members (elected for two years) and minor city officials. The water-works is owned and operated by the municipality and there is a paid fire department. Charlotte was settled about 1750, was incorporated in 1768, and became the county-seat in 1774. It received its city charter in 1866 and its present charter in 1907. The Mecklenburg Declaration

of Independence was signed in the city in May 1775. During the Revolution several bloody battles were fought in and around Charlotte. The British occupied the city in 1780. See MECKLENBURG COUNTY. Pop. (1907) 41,600.

Charlottenburg, shär-löt'tën-boorg, Prussia, adjoining Berlin on the west, and now practically forming part of it, on the banks of the river Spree. It contains a palace built for Sophia Charlotte, the first queen of Prussia, which was begun at the end of the 17th century. The town was founded soon after. The town contains various important educational and other institutions, including a school of artillery and engineering, and a technical high school. Pop. (1900) 189,290.

Charlottesville, shär'löts-vil, Va., county-seat of Albemarle County, on the Chesapeake & O. and the Southern R. R.'s, 96 miles southwest of Washington. It is the seat of the University of Virginia; is a popular summer resort; has important manufactures, electric lights and street railways, a national bank, and several daily and weekly newspapers. Pop. (1900) 6,449.

Charlottetown, shär'löt-town, Prince Edward Island, Canada, capital city of the province; in Queen's County at the head of Hillsborough Bay, at the confluence of three large tidal rivers, on the Prince E. I. Railway. Its fine harbor accommodates vessels of the greatest draught, and it has a large export trade. The country in the neighborhood is very fertile, and the horses of the district have a wide reputation. The fisheries are extensive and important; oysters and lobsters are plentiful, and are canned and shipped in large quantities. Charlottetown has carriage and furniture factories, iron foundries, woolen mills, railway workshops, shipyards, and breweries, banks, and daily, semi-weekly, and weekly newspapers. The streets are wide, and the town well built and lighted by gas and electricity. It has good water and sewerage systems. It has fine Dominion and Provincial buildings (post-office and courthouse), a city hall, Y. M. C. A., Athenæum, market, and exchange buildings; churches, hospitals, and an asylum for the insane. It has excellent public and normal schools, a business college, and is the seat of Prince of Wales College, Saint Dunstan's College (Roman Catholic), and a Methodist College. It is the seat of a United States consulate, and the see of a Roman Catholic bishopric. Charlottetown was founded about 1750, by the French, and was called Port la Joie. It came under English rule in 1763 with the cession of Canada. In 1775 it was raided by American privateers, but the prisoners were returned and the property of the people restored by order of Gen. Washington. The first conference toward a federation of the Canadian Provinces was held in Charlottetown in 1864. Pop. (1901) 12,080.

J. CASTELL HOPKINS,
Editor 'The Canadian Annual Review.'

Charm, anything believed to possess some occult or supernatural power, such as an amulet, spell, etc., but properly applied to spells couched in formulas of words or verses.

Among celebrated charms the Danish Danebrog, or national banner, stands prominent. This banner was said to have been woven in a

CHARMIAN — CHARPENTIER

day and a night by three daughters of a celebrated Norse chieftain, of the race of Ynglings, said to be descended from the god Odin. These girls were deeply versed in the lore of the gods, giants, dwarfs, and norns, and in the centre of the banner they placed a raven, the bird of Odin, wonderfully lifelike and realistic. The superstition was that the result of a battle was foretold by this raven, which if victory was to fall to the possessors of the banner, held its head and bill in an upright position.

By observing this banner the Danes in three years' time had won 27 important battles, going into action only when the raven looked skyward. If the bird looked droopy and held its head low, they remained in camp, or, if in action, and the attitude of the raven suddenly changed, they withdrew from the field.

Alfred, the king of the English Saxons, noting the enthusiasm which this banner inspired in the Danes, determined to capture it, and succeeded after a savage battle in which the Danes fought desperately for three hours. When, however, it fell into the hands of the Saxons, and the head and wings of the raven drooped, there was a general rout. The Danes were models of courage and bravery as long as superstition fanned the fire of faith in their hearts, but they were arrant cowards the minute they realized that their idol was powerless to protect them.

Another curious charm is to be seen in the National Museum at Washington. This is a necklace of human fingers which was captured from the Sioux Indians in 1876, the loss of which brought about the subjection of the Indians.

Charmian, kār'mī-ān, or **Charmion**, an attendant on Cleopatra in Shakespeare's 'Antony and Cleopatra.' After Cleopatra's suicide, Charmian also made away with herself.

Charnay, Claude Joseph Désiré, klōd zhō zēf dā-zē-rā shār-nā, French traveler: b. Fleuieux 2 May 1828. In 1857-61 he traveled in Mexico in behalf of the French ministry of education; from 1863 to 1878 he went on a number of expeditions to North and South America, Australia, and other countries. In 1880 he conducted an expedition to the ruined cities of Mexico, the expense of which was borne by Pierre Lorillard; and in 1886 again visited Yucatan. He has written 'Le Mexique, Souvenirs et Impressions de Voyage'; and 'Les Anciennes Villes du Nouveau Monde' (translated into English).

Char'nel-house, a chamber or building under or near churches, where the bones of the dead are deposited. In England the crypts of some churches were formerly used as charnel-houses.

Charon, kā'rōn, in mythology, the son of Erebus and Night. It was his office to ferry the dead in his crazy boat over the dark waters of Acheron, over Cocytus resounding with the doleful lamentations of the dead, and finally over the Styx, dreaded even by the immortals. The shades were each obliged to pay him an obolus, which was put, at the time of the burial, into the mouth of the deceased. Those who could not pay the fare, or had been so unfor-

tunate as to find no grave in the upper world, were compelled to wander on the desolate banks of the Acheron for 100 years, after which Charon would carry them to their final resting-place without charge. He was represented as an old man, with a gloomy aspect, matted beard, and tattered garments. The traditions relative to Charon are posterior to the Homeric age, and it is thought that the myth was imported into Greece from Egypt.

Charost, Armand Joseph de Bethune, är-män zhō-zēf dē bā-toon shā-rōst, DUKE OF: b. Versailles 1728; d. 27 Oct. 1800. He was a descendant of Sully, and distinguished himself on many occasions in the military service of his country. He was particularly active in the promotion of agriculture and public institutions. Long before the Revolution he abolished the feudal services on his estates, and wrote against feudal institutions. He established charitable institutions in sundry parishes, provided for the support and instruction of orphans, employed physicians and midwives, founded and liberally endowed a hospital. In a year of dearth he imported grain into Calais at his own expense. In the provincial assemblies he spoke against the *corvées*. In the assembly of the notables he declared himself for an equal distribution of the public burdens. During the Reign of Terror he retired to Meillant, where he was arrested, and did not obtain his liberty until after the 9th Thermidor. In the testimonies given in his behalf by the revolutionary committees he was called the father and benefactor of suffering humanity. He returned to Meillant, where he established an agricultural society. No sacrifice was too great for him, and his vast fortune was scarcely sufficient for his enterprises.

Charpentier, François Philippe, frän-swä fē-lēp shār-pän-tē-ā, French engraver and mechanic: b. Blois 3 Oct. 1734; d. there 22 July 1817. He studied copper engraving in Paris, and invented the aquatint process in engraving. Among his engravings by this process are 'Perseus and Andromeda'; 'The Beheading of John the Baptist'; 'A Shepherd'; 'The Italian Concert'; and 'The Children's Bacchanal' after De Witt. On account of his invention he was given the position of royal mechanic; in this capacity he perfected the lamps of lighthouses and devised a number of improvements in cannon and other firearms.

Charpentier, Gustave, French composer: b. Dieuze 1860. He was a pupil of Pessard and Massenet at the Paris conservatory; and won the grand prix de Rome in 1887. He has written a number of songs: 'Napoli,' a symphony; 'The Life of a Poet,' a symphonic drama; and an opera, 'Louise.' For the two latter he wrote both words and music.

Charpentier, Johann Friedrich Wilhelm Toussaint, German mining engineer: b. Dresden 24 June 1738; d. Freiberg 27 July 1805. He studied law and mathematics at Leipsic, then took a position as instructor in mathematics at the mining school of Freiberg, where he devoted himself to the study of mining methods. He investigated the improved process of amalgamation used in Hungary and introduced it in Germany, besides furthering a number of other improvements. He wrote

CHARPENTIER — CHART

‘Mineralogische Geographie der Kursächsischen Lande’ (1778); ‘Beiträge zur Geognostischen Kenntnis des Riesengebirges Slesischen Antheils’ (1804).

Charpentier, Louis Eugène, loo-ē è-zhān, French painter: b. Paris 1 June 1811; d. 7 Dec. 1890. He was a pupil of Gerard and Cogniet, and was professor of design at the Lycee at Versailles for over 20 years. He was best known as a military painter. His first picture of importance was ‘Bivouac of the Cuirassiers’; among other of his works are ‘Halt of the French Army on the Saint Bernard’; ‘Battle of Tchernaiia’; ‘Imperial Guard of Magenta’; ‘Retreat from Inkermann’; ‘Wellington in Spain’; ‘Charge of Cuirassiers at Waterloo.’

Charpentier, Marc Antoine, French composer: b. Paris 1634; d. there March 1702. He went to Rome with the intention of studying painting, but turned his attention to music and became a pupil of Carissimi. Returning to Paris he held the position of chapel-master at several places, finally at the Sainte Chapelle. He was the most prominent rival of Lully. He wrote several operas, ‘Tragédies Spirituelles’ for the Jesuit order, and a number of pastorales.

Charpie, shär-pē. See LINT.

Charpoy, chär’poi, in the East Indies, a small, portable bed, consisting of a wooden frame resting on four legs, with bands across to support the bedding.

Charqui, chär’kē, jerked beef, the Chilean name of which the English term is a corruption.

Charras, shär-rä, **Jean Baptiste Adolphe**, a French republican soldier and statesman: b. Pfalzburg, Lorraine, 7 June 1810; d. Basel, Switzerland, 23 Jan. 1865. He took part in the revolution of 1830, was promoted in 1833 to the rank of lieutenant, wrote a series of able articles in the ‘National’ on military affairs, which gave umbrage to the government and caused him to be sent to Algeria; distinguished himself there on the battlefield as well as in the training of native troops and the colonization of the country. After the revolution of 1848 he became under-secretary of state and representative for the department of Puy de Dôme. He was one of the victims of the *coup d’état* of 2 Dec. 1851. First detained at Ham, he was transported to Belgium in 1852, but expelled from that country in November 1854, at the request of Louis Napoleon, whom Charras had denounced on many occasions, but most effectively in a letter of which 50,000 copies were printed in Belgium alone. A remarkable work from his pen, ‘Histoire de la campagne de 1815,’ appeared in 1857.

Charras, chär’ras or chür’ras, a resinous substance which exudes from the Indian hemp and is collected for use as a narcotic or intoxicant, forming a considerable article of trade in Asia. See HEMP.

Charriere, shär-rē-är, **Madame St. Hyacinthe de**, French authoress, well known under the assumed name of the ABBÉ DE LA TOUR: b. Holland about 1740; d. 20 Dec. 1805. In early life she became a maid of honor at the court of the Stadtholder. Her affection for

her brother’s tutor, M. de Charrière, a worthy but decayed nobleman, led her to forego her rank and family, and shortly after her marriage she retired with him to a small property at Neufchâtel. Her lively temperament was ill suited for the monotony of a rustic life, and accordingly seeking amusement in literary recreations she soon acquired a considerable reputation. Having lost the greater part of her fortune in the French Revolution, she reduced her expenditure to the lowest possible amount, that she might be able to continue her various acts of benevolence. Her works belong chiefly to the class of light literature. Among others may be mentioned ‘Les Trois Femmes’; and the favorite dramas of ‘Le Toi et le Vous’; ‘L’Emigré’; ‘L’Enfant Gâté’; and ‘Comment le nomme-t-on.’ All these productions not only display much wit, truth, and powerful description, but also breathe a spirit of philosophy, and have a strong moral tendency. Most of them were translated into German by her friend Herder.

Charron, Pierre, pē-är shä-rôn, French preacher and writer: b. Paris 1541; d. 16 Nov. 1603. He studied law at Orleans and Bourges, and had practised for six years as a parliamentary advocate when he turned his attention to theology, and gained so much fame by his sermons that he was presented in rapid succession with several benefices in Gascogne and Languedoc, and appointed court chaplain to Queen Margaret. In 1588 he returned to Paris with the view of fulfilling a vow he had made to enter the Carthusian order, but owing to his age the prior of the order refused him admission, and the Celestines also declining to receive him, he continued a secular priest. In 1589 he went to Bordeaux and became very intimate with Montaigne, whom he tried to imitate, though he failed to catch his ease of style, and original, piquant wit. His principal works are ‘Traité des Trois Vérités,’ and ‘Traité de la Sagesse.’ The Roman Catholic zeal of the former drew down upon him the rebuke of Duplessis-Mornay; and the extreme liberalism of the latter exposed him to a charge of atheism, the treatise being condemned both by Parliament and the University.

Chart, a representation of a portion of the earth’s surface projected on a plane. The term is commonly restricted to those intended for navigators’ use, on which merely the outlines of coasts, islands, etc., are represented. A globular chart is a chart constructed on a globular projection. A Mercator’s chart is a chart on the projection of Mercator. A plane chart is a representation of some part of the superficies of the earth, in which the spherical form is disregarded, the meridians drawn parallel, the parallels of latitude at equal distances, and the degrees of latitude and longitude equal. A selenographical chart is a chart representing the surface of the moon; and a topographical chart is a chart of a particular place, or of a small part of the earth.

Charts are designed to assist the navigator and to subserve the interests of commerce. For purposes of navigation they may embrace large areas, like one of the great oceans or seas, delineating the conformation of the shores and outlying dangers, and perhaps indicating the principal currents and winds that may be utilized

CHARTA — CHARTE

in determining the most advantageous routes between specified localities. Charts may also embrace much smaller areas, but on larger scales, permitting greater fullness of detail, and thus presenting graphically the channels that can be followed, with the depths of water, the position of lights, beacons, spindles, buoys, and other objects provided to indicate the way to the stranger. Charts of these classes are usually designated "Navigation charts," although they may also be useful for other purposes.

Nearly all civilized nations have published charts of their coast lines in greater or less detail, and the principal maritime nations copy those issued by other nations, and thus maintain for the use of their own seamen charts of all parts of the world to which their commerce may extend. Great Britain maintains the most extensive establishment for the purpose, and issues the most complete series of charts; she has also made the most extensive surveys of uncivilized coasts for cartographic purposes.

The United States Coast Survey, a vast undertaking, was begun in 1807, carried on intermittently till 1845, and since then more systematically, save during the Civil War, under Prof. Bache, Prof. Pierce, and their successors. The coasts of the United States are surveyed and the charts produced by the Coast and Geodetic Survey attached to the Treasury Department, which also makes researches to determine the origin and courses of the Gulf Stream (q.v.). Unsurveyed foreign coasts are surveyed by the Bureau of Navigation, the charts being produced by the Hydrographic Office of the Navy Department. This bureau also duplicates charts and plans issued by other nations. The Coast and Geodetic charts are sold at from 10 cents to \$1 each, being the cost of printing and paper. Naval vessels are supplied free. The charts are obtainable at Coast and Geodetic Survey agencies at all seaports of the United States. They exhibit accurate and minute topography as far inland as will supply landmarks for the navigator or serve for purposes of defense; the shore line at high water, and sanding to mean low water; soundings, contours, and material of bottom at different depths; bars, channels, sailing ranges and directions; true meridian and compass variation; rocks, reefs, buoys, beacons, lights; tide establishment; detailed explanation of lighthouses and signal stations. They are carefully corrected for every substantial change in any of those features. They range in scale from $\frac{1}{2400}$ (30.401 inches to the nautical mile) to $\frac{1}{1200000}$ ($\frac{61}{1000}$ of an inch to the nautical mile). The Coast and Geodetic Survey issues four series of charts on the Atlantic and Gulf coasts of the United States, and three series on the Pacific coast, designed to subserve the purposes the surveys were established to meet. The first series includes "sailing charts," which embrace long stretches of coast, as from the Bay of Fundy to Cape Hatteras, Chesapeake Bay to the Bahamas, etc., and are intended to serve for offshore navigation, or between the greater headlands, as Cape Cod, Cape Hatteras, etc., and between distant harbors, as Boston to Chesapeake Bay, Charleston, etc. They show only the outline of the continent, the seacoast lights, and geographic information that will be useful for the purposes intended. The second series includes "general charts of the coast,"

also designed for purposes of navigation. They are on a scale three times as large as that of the first series, and embrace more limited areas, as the Gulf of Maine, Gay Head to Cape Henlopen, Galveston to the Rio Grande, etc. These charts serve the navigator in coasting alongshore between headlands, and in approaching harbors. Those of the third series, called "coast charts," embrace the whole coast on a uniform scale five times as large as that of the second series. Such charts are necessarily confined to comparatively short stretches of coast, as Sandy Hook to Barnegat, the entrance to Chesapeake Bay, Mobile Bay, etc. One inch on the paper represents about $1\frac{1}{4}$ statute miles, a scale sufficiently large to give the features of the topography and hydrography with great clearness, portraying the appearance of the coast and the irregularities of the bottom with a detail quite close enough for the navigation of the principal harbors. The fourth series consists of "harbor charts" on large scales, intended to meet the needs of local navigation. On the Pacific coast the first series is similar to that on the Atlantic coast, and extends from San Diego, Cal., to Point Barrow, Alaska. The second series is on a scale six times as large as the first, and is suitable for alongshore navigation and inland passages of southeast Alaska. The third series includes charts on scales like those of the fourth series on the Atlantic coast.

All these series of charts are published from the same original surveys, the details of the original work being generalized or omitted to meet the requirements any particular series is intended to subserve. Various methods are available for producing charts of these classes, but experience has demonstrated that on coasts like large portions of those of the United States, which are subject to frequent changes from natural causes, necessitating extensive corrections, engravings upon copper are the most expedient and economical. The engravings afford the additional advantage of being readily duplicated by the electrotyping process. All the standard charts issued by the bureau are therefore copperplate engravings. Preliminary editions, however, are frequently issued by means of the photo-lithographic process, which affords a cheap and ready method for temporary purposes.

The Survey publishes about 500 charts, with an average annual issue of 70,000 copies.

Char'ta, Magna. See MAGNA CHARTA.

Charte, shärt, a term originally used to indicate the rights and privileges granted by the French kings to various towns and communities. The first such charter in France is known as the *Grande Charte*, or the Charter of King John (1355). At present by the *Charte* is meant the fundamental law of the French monarchy, as established on the restoration of Louis XVIII. in 1814. As is well known, it was the violation of an article of the *Charte* by the ministers of Charles X. that led to the revolution of 1830, the expulsion of that monarch from the throne, and the accession of Louis Philippe, who, on 29 Aug. 1830, swore to a new charter, sensibly modifying that of 1814 in a liberal sense. After 18 years' sway, Louis Philippe was himself expelled from France, 24 Feb. 1848, and therewith the *Charte* which he was called to support fell to the ground.

CHARTER — CHARTER-HOUSE

Charter, a document by which a superior power grants permanent or continuing rights and privileges to an inferior, either a person or persons, corporation or institution, colony, municipality, etc. Originally it had the broader sense, now obsolete, of a conveyance of land. The mediæval charters ranged from a grant of political rights by a sovereign to an entire people,—like the Great Charter of England or the Golden Bull of Hungary, or colonial instruments of government conferring the broadest rights of sovereignty,—down to permissive acts for abbeys and colleges or trading companies, or confirmations of rights already given (called confirmatory charters). The first-named class in modern usage is called a constitution. Thus, the agreements by which recent monarchs have deprived themselves or been deprived of absolute power and shared it with their people, as with Austria in 1866, Japan in 1868, etc., are essentially the same as Magna Charta. Charters in present usage are restricted to municipalities, corporations, and institutions.

The charters for the American colonies were usually distinguished from "patents" by granting specific privileges of jurisdiction and legislation, and in general the powers needed to establish and continue a self-regulating community, instead of mere general grants of land and rights of settlement; but the two were often loosely used as interchangeable. Thus, in the acknowledgment of receipt of their charter in 1662, the Connecticut officials acknowledge also the "old charter," meaning the Warwick Patent. Strictly, they were all patents, as granted by the king under letters patent; but in use, only the grants to individuals were commonly termed patents, the word charter being reserved for those to companies and to colonies already established. Of these three species, the first includes the patents to Lord Baltimore for Maryland in 1632, to Gorges for Maine in 1639, to the Duke of York (afterward James II.) for New York in 1664, and to William Penn for Pennsylvania in 1681. The second comprises those to the Virginia Company in 1606, 1609, and 1612, the Plymouth and London companies in 1606, the Council for New England in 1620, the Massachusetts Bay Company in 1629, the proprietors of Carolina (1663) and Georgia (1732). The third has the two exemplars of Rhode Island (1643, confirmed 1663), and Connecticut (1662): instruments of such complete self-government that those States made no change at the Revolution, the former living under its 17th-century charter till 1818, and the latter till it was forced to change it by the Dorr Rebellion of 1842. The legal nature and implications of these documents were keenly disputed in the age when their interpretation was vital, and have been argued with scarcely less heat for historical reasons since. According to the English view, they were concessions granted by the government for political reasons, and revocable at its pleasure for the same reasons; the title to the lands as well as to the political privileges lay with the government, and its right to vacate either was limited only by policy; and charter governments had only such powers as were specifically given them in the charters. James II. put some of these theories in practice in the union of New England in 1685, and others were acted upon generally. On

the other hand the colonial view was set forth by Jeremiah Dummer in his 'Defense of the Charters' (1728); at least it was widely adopted. It was, that the charters were compacts between the government and the colonies, in consideration of the latter having cleared and taken possession of the territory and annexed it to the crown; and that the crown possessed only political rights there, the land title being derived from purchase and occupation and their own courage and labor. As to the powers of the charter governments, Judge Story holds that they possessed full sovereignty and power of legislation and taxation, subject only to not contradicting the laws of the mother country. The truth is that neither side had any very definite views on the matter at the outset, and both developed antagonistic ones under the stress of interest.

In the United States, charters (special or general) are granted by acts of the several State legislatures or by the national government. Thus, the national banking act, and the general railroad acts of most States prescribe the conditions under which corporations of those classes may organize without special permission, and their articles of association are their charter. The act by which a county or township is set off as an administrative division of a State is not termed a charter. On the other hand, that by which a municipality is organized, as a city or borough, is always so termed; but it has the vital distinction from a private charter that it is not a contract; the municipality has no vested rights, being a mere governmental agency and convenience; and the charter can be altered or repealed at any time by the legislature. A private charter, on the other hand, is a contract which cannot be repealed or modified by the public power unless such liberty has been expressly reserved in the charter itself. See DARTMOUTH COLLEGE CASE.

Charter-house, a celebrated school and charitable foundation in London, England. In 1370 Sir Walter Manny and Northburgh, Bishop of London, built and endowed it as a priory for Carthusian monks (hence the name, a corruption of *Chartreuse*, the celebrated Carthusian convent). After the dissolution of the monasteries it passed through several hands till it came into the possession of Thomas Sutton, who converted it into an hospital, richly endowed, consisting of a master, preacher, head schoolmaster, with 44 boys and 80 indigent gentlemen, together with a physician and other officers and servants of the house. Each boy is educated at a certain expense, and each pensioner receives food, clothing, lodging, and an allowance of about \$150 a year. The pensioners, "poor brethren," must be over 50 years of age, and members of the Church of England. The Charter-house School has been removed to new buildings near Godalming, in Surrey, while the non-academic department of the Charter-house still remains in the old buildings. The school has a high reputation, and many lads are educated there other than the scholars properly so called. Several of the famous men who have received their education at the Charter-house are Isaac Barrow, Addison, Steele, John Wesley, Blackstone, Grote, Thirlwall, Havelock, John Leech and Thackeray.

CHARTER OAK

Charter Oak, a tree nearly seven feet in diameter, formerly in Hartford, Conn.; it blew down in a storm, 21 Aug. 1856. A section of its trunk was preserved in the rooms of the Connecticut Historical Society; the remainder—currently believed to rival in miraculous powers of reproduction the loaves and fishes or the Mayflower furniture—was kept or sold for small souvenirs. It is thus venerated from a tradition, first accredited to it in 1789, that in a hollow of it was concealed the charter of Connecticut rescued from Andros in 1687; earlier ones specify an elm, others the houses of different persons. This is of little moment; but the adventures of the charter form a mystery which the latest investigations, instead of illuminating, render utterly insoluble. The contradiction of unquestionable facts is absolute. The story without these is sufficiently peculiar. James II., wishing to make Connecticut a part of his consolidated New England under Andros (q.v.), found its charter in the way; and as the colony declined to surrender it, he brought writs of quo warranto to vacate it, the last of which was returnable in February 1687. To delay or avoid voluntary surrender, yet escape forfeiture and entire outlawry of rights, they replied that they would much rather stay as they were, but if they could not, preferred a provincial union under Andros over annexation to any other province. The Council chose to consider this a formal waiver of charter rights, and dropped proceedings under the writ; and on 31 Oct. 1687 Andros rode over from Norwich to Hartford, under orders to assume the government. Calling the governor and council together, he demanded surrender of the charter according to their dutiful assurances. The meeting was secret; what happened we learn only from tradition, and the brief account of a later intimate of the actors. The colonial officials protested and debated till after dark; that this was prearranged is not only morally certain in itself, but Trumbull's account of a long speech by the governor, to no conceivable purpose otherwise, deepens the certainty. Candles were lighted; the charter was (or the charters were) at last brought in and laid on the table; suddenly some officious candle-snuffers put out all the lights, and when they were relighted no charter was to be seen. But if Andros had no longer a charter to suppress, equally the colony had no longer one to appeal to; the old government was just as effectually extinguished as if they had let him have the paper, they cannot have foreseen a revolution in England, and it is not evident what they intended to do with it. Most likely, from their previous actions, it was merely to save their "face" from the humiliation of a formal surrender. There was no outcry by Andros, no charge made against the officials, no appearance of ill-will to them, no report of the affair to England, seemingly no disclosure of it to the train of Massachusetts magnates who accompanied him (and may or may not have attended the meeting), or to any one else; and (perhaps the most curious of all the circumstances of this curious affair) both our informant and tradition stop short at the relighted candles and the missing document, and give no hint what Andros said or if he said anything, or whether he seemed puzzled or offended, or any of the immediate sequelæ of the business. The gov-

ernor (Treat) had called a meeting of the General Court, which accepted the situation and the annexation; the secretary inscribed it on the colonial records and wrote "Finis" on them; and the next day Andros publicly proclaimed his commission. When James was overthrown and Andros with him, the colony resumed its government, appealed to its charter brought from hiding, and the English authorities admitted without trial that it had never been vacated. But that was chance and not foresight. This, however, is only the beginning of mystery. The charter, obtained by Gov. John Winthrop from Charles II.'s council in April 1662, was engrossed in duplicate, and the official fees are entered on the English records. No other copies were made, nor could have been unless both the others were lost; and neither was lost. The first copy was sent to the colonial government, which acknowledges receipt of "the charter, the duplicate and the old copy of the former charter" (that is, the Warwick Patent). Duplicate of what? It is usually assumed to mean, of the charter; but the facts to be cited prove that it was of the patent. Winthrop was to bring over the duplicate of the charter with him; and a legislative committee was appointed to receive it from him. That he did not, is conclusively shown by a letter from the colony to its agent, William Whiting, in 1686, instructing him to obtain it from James Porter in London, with whom Winthrop had left it, and use it in defending the colony's rights before the council. That Winthrop may have taken it across once more on official business, and left it there, is barred out by the fact that he never visited England again. That Whiting sent it back within the next year, is equally negatived by the fact that he continued to need it there and the colony did not need it at all, that he would not have sent it without orders and they gave him no such orders, and that in his correspondence there is no letter of transmittal. Furthermore, a legislative committee of 1715 voted a money acknowledgment to Joseph Wadsworth for safely preserving the "Duplicate Charter" when "our constitution was struck at": it is absurd to suppose they made him the grant for preserving a second copy when they had one safe already. Obviously, the one he preserved was the only one they had. On the other hand, Roger Wolcott, the first narrator (1759), distinctly says that "the charters were set on the table," and that when the candles were relighted the *charters were* gone. Still more specifically, President Stiles of Yale writes in his Itinerary, as from Wolcott, that Nathan Stanley took one copy and Gov. Talcott's father the other. Wolcott was only eight at the time; but by 1714 he was in the council, in 1715 was on the very committee which made the grant to Wadsworth, and was certainly intimate with many who were present at the scene and probably helped arrange it. We have, then, the certain fact that there was but one copy of the charter in America in 1687, set against the positive assertion of one who must have known, that two were abstracted. Still a third mystery is, that Wadsworth was not present at the meeting and could not have taken the paper; that Wolcott, who publicly honored Wadsworth as the savior of the charter, privately gives all the credit to others and does not even mention Wadsworth,

CHARTER-PARTY — CHARTRAN

and that the names he cites are really those of members present; and that if one of the actual abstracters passed it to Wadsworth waiting outside, he and not they should receive the public acknowledgment. The writer can guess at solutions to these problems, but all solutions are guesses alike.

ALBERT C. BATES,
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Charter-party, a contract executed by the freighter and the master or owner of a ship, containing the terms upon which the ship is hired to freight. The masters and owners usually bind themselves, the ship, tackle, and furniture, that the goods freighted shall be delivered (dangers of the sea excepted) well-conditioned at the place of the discharge; and they also covenant to equip the ship complete and adequate to the voyage. The charterer is bound to furnish the cargo at the place of lading, and to take delivery at the port of discharge within specified periods called lay days; and penalties are annexed to enforce the reciprocal covenants.

Char'teris, Archibald Hamilton, Scottish clergyman: b. Wamphay, Dumfriesshire, 13 Dec. 1835. He was educated in the University of Edinburgh, where in 1808, after holding two Presbyterian pastorates, he became professor of biblical criticism. In 1898 he was made professor emeritus. Since 1901 he has been chaplain-in-ordinary to King Edward VII. He has published 'Life of Professor James Robertson' (1863); 'Canonicity' (1881); 'The Christian Scripture' (1888).

Charters Towers, Australia, a mining township of Queensland, on the northern spurs of the Towers Mountain, 820 miles northwest of Brisbane. The place was first settled in 1871-2, when gold was discovered there. In 1877 it was incorporated as a town. Now it has railway connection with the coast by means of a railroad to Townsville. The yield from the gold fields, up to 1891, was 2,300,000 ounces. Pop. (1891) of the town, 4,597; of the field, 14,129.

Chartier, kär-tē-ā, Alain, French poet and moralist: b. Bayeux about 1392; d. about 1440. He was educated at the University of Paris, and was appointed by Charles VI. clerk, notary, and secretary of the royal household—posts which he held under Charles VII. His contemporaries considered him the father of French eloquence. Although far from handsome it is said that he received one day while asleep a kiss from Margaret of Scotland, wife of the dauphin, who explained her conduct to the surprised bystanders by saying that it was not the man she kissed, but the mouth whence flowed so many golden words. His poems are often graceful and nervous, and his vigorous prose contains many fine thoughts and prudent maxims. The first edition of his works which bears a date is that of 1489; the most esteemed that of 1617.

Chartism, a working-class movement in England, 1838-48, the primary purpose of which was the attainment of certain political reforms. The Reform Bill of 1832 had failed to bring the expected advantages to the working class; the new poor law of 1835 was unpopular; and a period of general commercial depression and a succession of bad harvests had increased the

sufferings of the people. The discontent resulting found definite expression in the "Charter" or "People's Charter" prepared in 1838 by a committee of six members of Parliament and six working-men. It comprised six heads, (1) Universal suffrage, or a right of voting conferred on every male of 21 years of age, of sound mind, unconvicted of crime, and a native of the United Kingdom, as well as to every foreigner possessing the same qualifications, who had been resident in the United Kingdom for more than two years; (2) equal electoral districts; (3) vote by ballot; (4) annual parliaments; (5) no other qualification to be necessary for members of Parliament than the choice of the electors; (6) members of Parliament to be paid for their services.

At first a portion of the middle class supported the movement, but they became estranged, and the Chartists became more and more a distinctively working-class party. The movement was not purely political; it was of a distinctively social nature, and aimed at the improvement of general social conditions. Stephens, one of the leaders, is quoted as saying "Chartism is no political movement where the main point is gaining the ballot. . . . The Charter means a good house, good food, prosperity, and shorter working hours." Immense meetings were held throughout the country, numbering sometimes upward of 100,000, and popular excitement was great. Physical force was advocated by some as the only effectual means for the masses to obtain their demands. An association called the National Convention was embodied, and commenced its sittings in Birmingham in May 1839. In June of the same year a petition in favor of the charter was presented to the House of Commons, which refused to take it into consideration. The feeling of exasperation among the Chartists increased, and in November a riot took place at Newport, in which 10 persons were killed and great numbers wounded. The year 1842 was the time of the most excitement; great riots took place in the northern and midland districts of England, and these, though not directly caused by the Chartists, were more or less connected with the movement, and the party was blamed for them. In 1848 a great demonstration took place in London, but the precautions taken by the government in enrolling special constables and making other preparations for defense frightened the leaders, and from that time Chartism rapidly declined.

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Chartran, shār-trāñ, Théobald, French painter: b. Besançon 21 Jan. 1849; d. 16 July 1907. He studied under Cabanel, and obtained the grand prix de Rome in 1877. He painted mostly historical pictures or portraits; among his works are 'The Body of Monseigneur Darboy lying in state in the Palace of the Archbishop of Paris'; 'Angelica and Roger'; 'Vision of Saint Francis of Assisi'; 'Capture of Rome by the Gauls'; and several portraits of which the best are those of Mounet-Sully as Hamlet, Sadi Carnot, and Leo XIII.

Chartres, shärtr, **Robert Philippe Louis Eugène Ferdinand D'Orleans**, DUC DE, grandson of Louis Philippe: b. Paris 9 Nov. 1840. When only two years old he lost his father, and six years later the Revolution drove him, along with his family, into exile. The young duke was brought up in England, and joined the Union army in the first campaign of the American Civil War, in 1862. He married, 11 June 1863, Françoise Marie Amelie d'Orleans, eldest daughter of the Prince de Joinville.

Chartres, shärtr (anciently AUTRICUM, CIVITAS CARNUTUM), France, capital of the department Eure-et-Loire, 49 miles southwest of Paris, situated on the slope of a hill, at the foot of which flows the Eure, and partly enclosed by walls and ditches, surrounded by ramparts planted with trees, which form an agreeable promenade. Most of the houses are built of wood and plaster, and have their gables toward the street. The streets of the lower town are narrow and crooked, and so steep in some parts as to be inaccessible to carriages. There are several public squares, one of which is of great extent. The only public buildings of note are the cathedral, the church of St. Pierre, contiguous to a huge barrack, once a Benedictine abbey; and the obelisk to the memory of Gen. Marceau. The cathedral, one of the most magnificent in Europe, is rendered conspicuous by its two spires, one of which is 403 feet high, surmounting the hill on which the city stands. It has 130 windows filled with painted glass of admirable workmanship; and in its chair Henry IV. was crowned in 1594. Chartres is the seat of a bishopric, communal college, seminary, and agricultural society; and has two hospitals, a cabinet of natural history, botanical garden, and a public library. Toward the end of the 11th century it was fortified, and in 1145 St. Bernard preached, in its cathedral, the second crusade. Pop. (1896) 19,213.

Chartreuse, shär-tréz, the French term for a Carthusian monastery, corresponding to the Italian Certosa. The order of the Carthusians (q.v.) was most rigorous in its rules, though each monk was allowed a decent cell and a garden of his own, so that the monasteries had often architectural character. The famous monastery called La Grande Chartreuse is the original and supreme monastery of the order, and exists in the mountains not far from Grenoble in eastern France. Of the monastic buildings still existing, none is architecturally noble, and nearly all are of date later than the middle of the 17th century. Therefore it does not rank with the great show-places of monasticism for the grandeur and splendor of its buildings, but has ever attracted travelers, curious or serious, as being the home of the most authentic exemplars of primitive monasticism in its rigor. At the Revolution the whole establishment was confiscated, the monks being driven out and secularized or banished. But in 1816 the order of Carthusians was permitted again to occupy the buildings, as tenants of the state, at a nominal rent. They were again expelled from their ancient home by the government of the French republic in 1903 under the laws for suppression of religious houses. When the monks were this time dispossessed the entire rural population of the vicinity, who had all their lives experienced the large, wise beneficence of the monks in

supporting the local hospitals, schools, churches, and the like, with their lives would have defended their benefactors against the power of the government had not the Carthusians counseled patience and forbearance. Till this second ejection from their home the monks used to derive a revenue from the sale of certain medicinal agents prepared in their laboratories which enjoyed a high reputation; in particular, the cordial liqueur Chartreuse. The other preparations were an elixir and a salve.

Chartulary, kär'tū-lā-rĭ, a collection of charters. When any body, ecclesiastical or secular, came to be possessed of a considerable number of charters, it has been customary for convenience and safety to have them classified and copied into a book or roll. Such book or roll has generally received the name of a Chartulary. Mabillon traces Chartularies in France as far back as the 10th century, and some authorities say that Chartularies were compiled even still earlier; but it was not till the 12th and 13th centuries that Chartularies became common. They were kept by all kinds of religious and civil corporations, but also by private families. Many of them have been printed, and their contents generally are of the greatest value in historical, archæological, and genealogical inquiries. The name is in Scotland applied to the record of feu-charters kept by the superior's law-agent. Copies of valuable historical documents, whose originals have been lost, have been found in chartularies.

Charybdis, kā-rĭb'dīs, an eddy or whirlpool in the Straits of Messina, celebrated in ancient times, and regarded as the more dangerous to navigators because in endeavoring to escape it they ran the risk of being wrecked upon Scylla, a rock opposite to it. There are several whirlpools in this region which may have been dangerous enough to the undecked boats of the Greeks, but none which the modern navigator with due caution may not easily pass. The name comes from the mythological story of Charybdis, the daughter of Poseidon and Gæa, whom Zeus, on account of her anger, hurled into the sea, where she became a whirlpool and swallowed up every ship that approached. This whirlpool is now called Calofaro and La Rema.

Chas'ca, the name under which the ancient Peruvians adored the planet Venus.

Chase, Ann, American patriot: b. Ireland 1809; d. Brooklyn 24 Dec. 1874. She came to the United States in 1818; settled in New Orleans in 1832; removed to Tampico, Mex., in the following year, where she married Franklin Chase, United States consul, in 1836. During the war with Mexico, in the absence of her husband, she remained at the consulate to protect the American records. On one occasion a mob attempted to pull down the American flag floating over the consulate, but she protected it with drawn revolver, and declared that the flag should not be touched except over her dead body. Later through her efforts the city of Tampico was taken.

Chase, F. H., English biblical scholar: b. 21 Feb. 1853. He was educated at Christ's College, Cambridge, took orders in the English Church and was successively curate of Sher-

CHASE

borne, Dorset, 1876-9, and St. Michael's, Cambridge, 1879-84. He was lecturer in theology at Pembroke College 1881-90, and at Christ's College 1893-1901, and has been principal of the Clergy Training School at Cambridge from 1887, Norrisian professor of divinity from 1901, and president of Queen's College from the last named year, also. He has published 'Chrysostom' (1887); 'The Lord's Prayer in the Early Church' (1891); 'Old Syriac Element in Codex Bezae' (1895); 'Syro-Latin Text of the Gospel' (1897); 'Credibility of the Book of Acts' (1901).

Chase, George, American lawyer: b. Portland, Me., 29 Dec. 1849. He graduated valedictorian at Yale in 1870, and at Columbia Law School in 1873. He was assistant professor of municipal law at Columbia University 1874-8; professor of criminal law, torts and procedure 1878-91; member of the university council 1890-1. In 1891 the New York Law School was chartered through his efforts, and he was chosen its dean, a position he still holds. Publications: 'The American Student's Blackstone' (1876); editor of 'Ready Legal Adviser' (1881); of Stephens' 'Digest of the Law of Evidence' (1886); 'N. Y. Code of Civil Procedure'; Chase's 'Cases on Torts.'

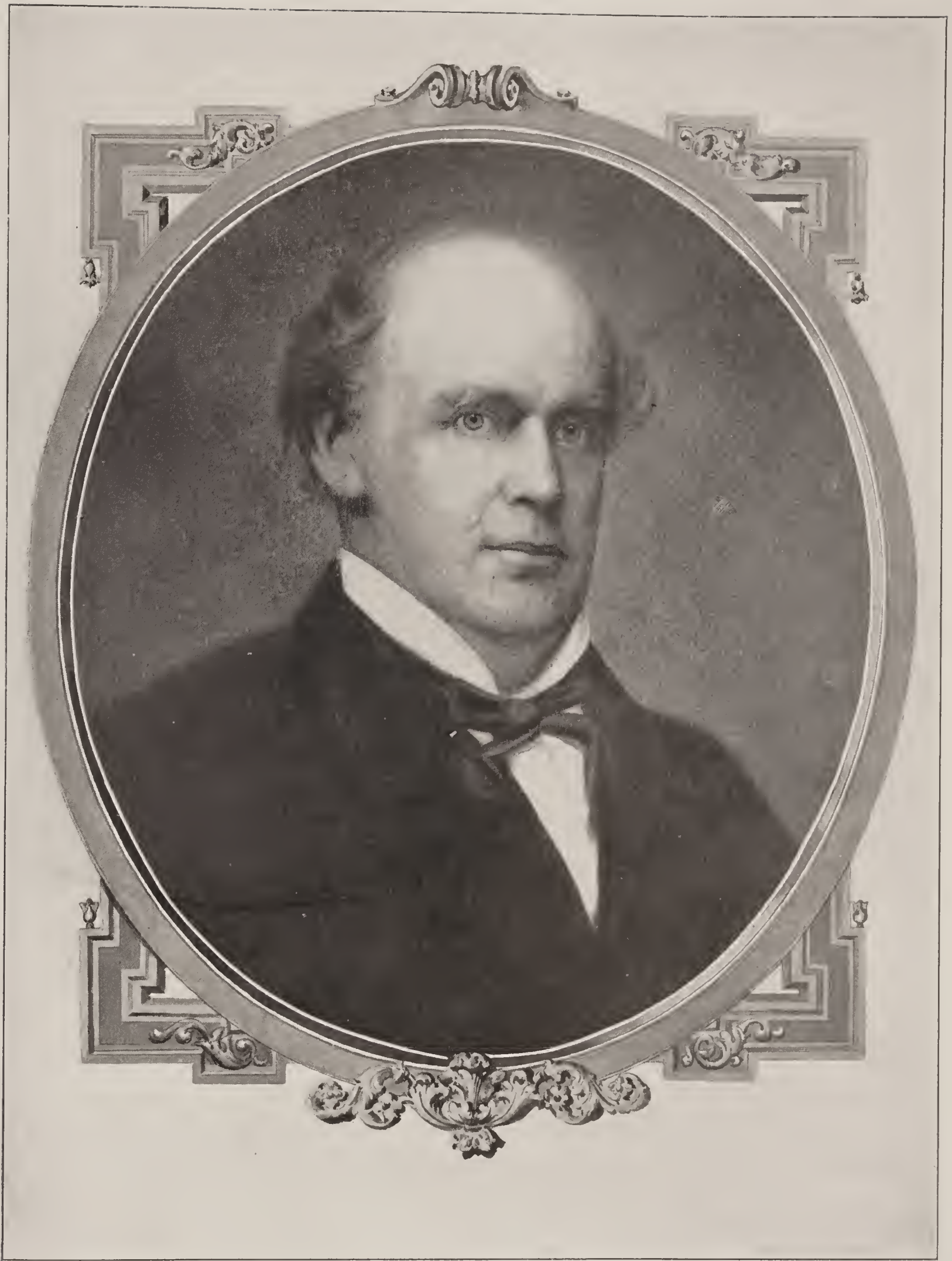
Chase, Philander, American Protestant Episcopal bishop: b. Cornish, N. H., 14 Dec. 1775; d. Jubilee College, Ill., 20 Sept. 1852. He graduated at Dartmouth College in 1795, and was ordained priest by Bishop Provoost 10 Nov. 1799. After missionary work in New York State, and rectorships at New Orleans, La., and Hartford, Conn., he set out as a missionary in districts west of the Alleghanies. In Ohio he organized various parishes, and in 1819 was consecrated the first bishop of Ohio. Between 1821 and 1831 he was for two years president of Cincinnati College, but chiefly engaged in perfecting plans for a theological seminary. He visited England, and through the influence of Lord Gambier and Lord Kenyon raised a large sum of money, \$30,000, with which he founded the Theological Seminary and Kenyon College, at Gambier, Ohio. In 1831 he resigned his bishopric and the presidency of the college and seminary, removed to Michigan 1832, was chosen bishop of Illinois 1835; again visited England and raised \$10,000 with which he founded Jubilee College, Peoria County, Ill. Upon the death of Bishop Griswold in 1843, Bishop Chase became presiding bishop of the Church. "He was abundant in labors; indefatigable in zeal." He wrote: 'A Plea for the West' (1826); 'The Star in the West, or Kenyon College' (1828); 'Defense of Kenyon College' (1831); 'A Plea for Jubilee' (1835); 'Reminiscences: An Autobiography' (1844).

Chase, Pliny Earle, American scientist: b. Worcester, Mass., 18 Aug. 1820; d. Haverford, Pa., 17 Dec. 1886. He graduated at Harvard, 1839; taught in Philadelphia and engaged in business for many years, but employed his leisure in physical and philological studies. In 1864 the Magellanic gold medal of the American Philosophical Society was awarded him for his 'Numerical Relations of Gravity and Magnetism.' The results of other mathematical and physical researches were published from time to time in the 'Proceedings' of the American Philosophical Society, and brought him a wide

reputation, both in the United States and abroad, as a man of unusual scientific powers and attainments. In 1871 he became a member of the faculty of Haverford College, Pa., and for a long time was professor of philosophy and logic. He published 'Elements of Meteorology' (1884).

Chase, Salmon Portland, American jurist: b. Cornish, N. H., 13 Jan. 1808; d. New York 7 May 1873. He was the son of Ithamar Chase, a farmer, and was, on his mother's side, of Scotch descent. At the age of nine he lost his father and later came under the care of his uncle, Philander Chase (q.v.), Bishop of Ohio, attended his uncle's school and working on the farm in Worthington. In 1822 he removed with his uncle to Cincinnati, returning soon after to New Hampshire, where he entered Dartmouth College, graduating in 1826. For three years he taught school in Washington, D. C., studied law under William Wirt, and in 1830 went to Cincinnati, where he began the practice of law. He soon made his influence felt as a lecturer, as publisher of the laws of Ohio (a work which insured his standing as a lawyer even if it did not reward him financially) and as a historian. His historical work was only a sketch, but it called attention to the importance of the study of the Ordinance of 1787. In 1834 Chase was married; he had five children, most of whom died in youth. His daughter, Kate Chase Sprague, handsome, brilliant and of great force of character, is in some respects one of the most remarkable women in our history. She was, in a large sense, her father's political manager and used every effort to secure his nomination to the presidency in 1864. Neither she nor her father saw anything incongruous in this, although the latter was at the time President Lincoln's secretary of the treasury. Chase, early in his career, identified himself with the anti-slavery movement. His advice and aid as a lawyer were frequently asked and never refused, his defense of the fugitive slave, Matilda, being one of his most notable efforts in this direction. Another celebrated case was that of the Kentucky farmer, Van Zandt, the original Van Tromp in 'Uncle Tom's Cabin.' Chase appeared for the defendant in 1842, and after an appeal to the supreme court of the United States, the case was argued before that tribunal by Chase and William H. Seward. Chase was an abolitionist, not of the school of William Lloyd Garrison, but that of James G. Birney. He maintained that Congress could not rightfully place on State officials the obligation of enforcing the Fugitive Slave Law. His attitude toward slavery, by a strange combination of circumstances, made him United States senator, in 1849. In the legislature which elected Chase two Independents held the balance of power. They united with the Democrats, making the necessary 55 votes. This coalition did not compromise Chase in his subsequent career in the Senate, as his election was practically forced upon the Democrats. In the Senate he continued his opposition to slavery, during the stormy scenes of the period of compromise in 1850, and was severe in his attitude toward Clay's position.

During Chase's term of office the Republican party, composed largely of opponents of the



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SALMON PORTLAND CHASE,

CHIEF JUSTICE OF THE UNITED STATES SUPREME COURT, 1864-1873.

CHASE — CHASIDIM

Kansas-Nebraska bill, was being formed, and Chase early identified himself with it. By this party he was nominated as governor of Ohio and in 1855 was elected, and re-elected in 1857. He was still the negro's friend, and some of his acts as governor in connection with this aspect of his administration have been freely criticised. Chase was a prominent candidate for the Republican nomination for the presidency in 1860, but was destined to see the votes of his own State nominate Abraham Lincoln. He became Lincoln's secretary of the treasury, a position which he filled during the four years of the Civil War. The national banking system, practically as it exists today, is to be attributed to his influence. On four or five different occasions Chase offered his resignation, but Lincoln repeatedly declined to relieve him of his post. Upon the death of Chief Justice Taney in 1864, President Lincoln appointed Chase to the vacant office, which he filled till the time of his death. When the question arose of a presidential nomination by the Democratic party, he defined his changed attitude in the following words: "I can not approve in general what the Republican party has done. I hold my old faith in universal suffrage, in universal amnesty, and in inviolate public faith; but I do not believe in military government for American States." His position was not altogether indefensible, for he was in all essentials, except his convictions on the slavery question, a Democrat of the school of Jackson and Benton. Chase loved his friends and aided them whenever opportunity offered. His only intimate personal friend among the public men of his own age, was Charles Sumner. Chase lacked that comprehension of the common people that so strongly characterized Lincoln. His attitude toward Lincoln doubtless accounts for some of his unpopularity, but in all his public acts he was honest and sincere. See Schucker's 'Life and Public Services Salmon P. Chase' (1874).

Chase, Samuel, American jurist: b. Somerset County, Md., 17 April 1741; d. 19 June 1811. His father, a learned clergyman, instructed him in the classics; later he studied law at Annapolis, being admitted to the bar at the age of 20. Having become a member of the colonial legislature, he distinguished himself by his bold opposition to the royal governor and the court party. He took the lead in denouncing and resisting the Stamp Act, and became a most active adversary of the British government in his State. The Maryland Convention of 22 June 1774 appointed him to attend the meeting of the General Congress at Philadelphia in September of that year. He was also present and conspicuous in the subsequent Congresses during the most critical periods of the Revolutionary War. That of 1776 deputed him on a mission to Canada along with Dr. Franklin, Charles Carroll of Carrollton, and the Rev. John Carroll. He signed the Declaration of Independence without hesitation. In June 1783 the legislature of Maryland sent him to London as a commissioner to recover stock of the Bank of England, and large sums of money which belonged to the State. In 1791 he accepted the appointment of chief justice of the general court of Maryland. Five years afterward President Washington made him an associate judge of the supreme court of the

United States. Political cases of deep interest having been tried when he presided in the circuit courts, and his conduct having given much displeasure to the Democratic party, he was impeached by the national House of Representatives. The trial of the judge before the Senate is memorable on account of the excitement which it produced, the ability with which he was defended, and the nature of his acquittal. He continued to exercise his judicial functions with the highest reputation till 1811, in which year his health failed.

Chase, Thomas, American educator: b. Worcester, Mass., 16 June 1827; d. Providence, R. I., 5 Oct. 1892. He was a brother of Pliny E. Chase (q.v.). In 1855 he became professor of philology and classical literature at Haverford College, near Philadelphia; in 1875 its president. Among his publications are: 'Hellas: Her Monuments and Scenery' (1861); an address on 'Liberal Education: Its Aims and Methods.'

Chase, William Henry, American military officer: b. Massachusetts 1798; d. Pensacola, Fla., 8 Feb. 1870. He was graduated at the United States Military Academy, became first lieutenant of engineers in 1819, captain in 1825, and major in 1838. He was engaged in repairing Fort Niagara in 1817-18; as superintending engineer for many important works in 1819-28; and had charge of the defenses in Pensacola harbor, Fla., 1828-54. He superintended the improvements of Mobile Bay; as senior engineer officer had charge of all the fortifications and river and harbor improvements at the mouth of the Mississippi; and took an influential part in all projects connected with the development of the region around Pensacola. At the outbreak of the Civil War he entered the Confederate army, and was prominent in the seizure of the Pensacola navy yard.

Chase, William Merritt, American artist: b. Franklin, Ind., 1 Nov. 1849. He studied painting in oil at the National Academy in New York and subsequently in Europe with Piloty. He has made a specialty of portraits and figure pieces, winning celebrity with 'Ready for the Ride,' 'The Apprentice,' and 'The Court Jester,' and portraits of American ladies. He was appointed instructor at the Brooklyn Art School in 1881 and elected a National Academician in 1890. In 1896 he conducted an art class to Madrid.

Chasidim, kă-sě'dim, or **Pietists**, the name of a Jewish sect which appeared in the middle of the last century. Its adherents are strongly inclined to mysticism, depreciate the Old Testament and its ordinances, and deem themselves able to approach the Source of Light by means of a virtuous life, prayer, and secret meditation. They have a great esteem for the Haggadas of the Talmud, the books of the Cabbala, and the writings of their own teachers, which are full of tales, extraordinary cures, and mystic interpretations, but also contain excellent moral precepts. The founder of the sect was Israel of Podolia, surnamed Baalschem (contracted into Bescht), from his supposed influence with God and the spiritual hosts, whom he could move by his prayers and amulets to grant whatever he desired. At the head of the sect are three superiors or Zaddiks, each of whom has a particular diocese or district allotted to

CHASING — CHASSEPOT RIFLE

him, and jurisdiction over all the Chasideans resident within it. They are most numerous in Russian Poland, Moldavia, Wallachia, and some parts of Galicia and Hungary, and are regarded with great antipathy by the orthodox Jews. Chasidim is also the name given to a sect which sprang up about the second century B.C. This party is credited with the origin of the revolt of the Maccabees, with combating the erroneous notions bred among the Jews by the study of Grecian philosophy, and with being the parent stock of the Pharisees. See JEWISH SECTS.

Chasing, the art of cutting artistic or ornamental designs on metals. Figures on metal are often produced in relief by being punched out from behind, and sculptured or finished on the front with small chisels and gravers. It is this latter process that is properly called chasing, and the same term is applied to designs produced by hand-tools on more or less flat surfaces.

Chasles, Michel, mē-shĕl shāl, French engineer: b. near Chartres 15 Nov. 1793; d. Paris 18 Dec. 1880. He entered the École Polytechnique in 1812, and on leaving was classed among the engineers; but with rare generosity he renounced his place as an officer in order to assure a career to one of his unsuccessful comrades. In December 1829 he addressed to the Brussels Academy a memoir on two general principles of geometry, duality and homography. The introduction to this memoir expanded into the well-known 'Historical View of the Origin and Development of Method in Geometry,' the first edition of which was published in 1837. In 1841 he was appointed to the chair of Machines and Geodesy at the École Polytechnique, and in 1846 to that of Higher Geometry, which had just been instituted at the Sorbonne. Some of his published works are: 'Treatise on Higher Geometry' (1852); 'The Three Books of Euclid's Porisms Re-established for the First Time' (1860); 'Treatise on Conic Sections' (1865); 'Reports on the Progress of Geometry' (1870). These, his principal works, are geometrical and historical. His contributions to the 'Comptes Rendus' of the Academy of Sciences and to other scientific publications are extremely numerous, and though in the main geometrical, are not exclusively so. In particular he treated in several memoirs the question of attraction, and gave the first synthetic demonstration of a celebrated theorem of Maclaurin on the attraction of ellipsoids. Two of his memoirs on the properties of cones of the second degree, and on the spherical conics, were translated into English, and published, with additions, by Charles Graves in 1841. During his long life he was the recipient of many scientific distinctions, and he will always be cited as one of the great geometers of the present century.

Chasles, Victor Euphémion Philarete, French critic: b. Mainvilliers, near Chartres, 8 Oct. 1798; d. Venice, 18 July 1873. The son of a Jacobin, and educated according to Rousseau, he acquired the point of view which, enlarged by life abroad, makes his essays so unique and instructive. He has written in every imaginable prose form, from a romance to a riddle; but his enduring work is contained in 'French Language and Literature from the Beginning of the Sixteenth Century to 1610' (1828);

'Studies of Antiquity' (1847); 'Studies of the Sixteenth Century in France' (1848); 'Journeys of a Critic Through Life and Books' (2d series, 2d ed., 1866-8); and 'Memoirs' (1876-8).

Chassaignac, shă-sân-yäk, Charles Louis, American physician: b. New Orleans, 5 Jan. 1862. He was graduated at the medical department of the University of Louisiana; and was president and Professor of Genito-Urinary Diseases at the New Orleans Polyclinic in 1902. He was editor of the 'New Orleans Medical and Surgical Journal'; president of the Orleans Parish Medical Society; vice-president of the Louisiana State Medical Society; one of the founders and president of the New Orleans Sanitarium and Training School for Nurses; etc.

Chassé, shă-sā', David Hendrik, BARON, Dutch soldier: b. Thiel in Guelders 18 March 1765; d. Breda 2 May 1849. He began his military career when but 10 years of age; became lieutenant in 1781, and captain in 1787. After the failure of the revolutionary movement he took French service; was appointed lieutenant-colonel in 1793; and two years later found himself marching toward the Netherlands under the command of Pichegru. He afterward fought with the French in Germany and Spain, gaining great distinction, and from Napoleon himself, because of his fondness for bayonet charges, the name of "Général Baïonette." He was made a baron by Louis Bonaparte in 1809. As lieutenant-general of the Dutch forces, in 1815, Chassé did good service at Waterloo against his old comrades, the French. As governor of Antwerp he defended the citadel for three weeks with 5,000 men against 60,000 Belgians and French (1832).

Chassepôt, Antoine Alphonse, än-twän äł-fôns shäs-pō, French inventor: b. 4 March 1833; d. Gagny, in the Seine-et-Oise, 14 Feb. 1905. He was an employee in the Paris arsenal of St. Thomas, where he became an official in 1858, and in 1863 brought before the government the model of his breech-loading rifle, adopted three years afterward, and subsequently abandoned. It was about four pounds lighter than the needle-gun and about one pound lighter than the Martini-Henry rifle.

Chassepot (shäs-pō) Rifle, a breech-loading rifle, named after its inventor, and adopted as the firearm of the French infantry in 1866, after the value of the Prussian needle-gun had been shown in the war between Prussia and Austria. It is not now in use, having been replaced in the French army by a much modified form of small-arms. It belonged to the same system as the needle-gun, but was believed to have sundry advantages over that weapon. It was considerably lighter than the needle-gun, the weight of the latter being 12 pounds, and that of the former less than nine pounds. In accuracy, penetrative power, length of range, lowness of trajectory, and rapidity of fire, it was inferior to the Martini-Henry. To the needle-gun it was superior in length of range and lowness of trajectory, as was shown in the war of 1870, in which the French could open fire at the distance of 1,500 paces, while the effective range of the needle-gun was only 400 to 500 paces. This superiority, however, was neutralized by the fact that its lightness and

CHASSEUR — CHASTELET

its large charge had the effect of producing great recoil and of heating the barrel. At the commencement of an action the men would open fire at long ranges, but before closing with the enemy the barrel of their piece was so heated that the weapon could hardly be handled. From the recoil and heating combined, the soldier was obliged to fire from the hip, so that his aim was not accurate; while after much firing the breech became clogged.

Chasseur, shä-sër, a male attendant upon persons of distinction, attired in a military dress, and wearing a sword. It is also the name given by the French to bodies of light infantry which act as skirmishers and sharpshooters. The name was originally given to some troops raised in 1815, in imitation of the *Jägers* of the Austrian army, who were chiefly Tyrolese chamois-hunters, and unerring marksmen. The French Chasseurs are of two kinds, light cavalry and infantry. Every battalion of infantry has a company of Chasseurs, but the term is more particularly applied to that body of men called the Chasseurs de Vincennes, who were enrolled and armed with rifles in 1833, and quartered at Vincennes. The Chasseurs of the Italian army are called *Bersaglieri*. Garibaldi's Chasseurs, that took a prominent part in the Italian war of 1859, and in the campaign against Francis II. of Naples, in 1860, were known as *Cacciatori dei Alpi*, or Alpine hunters.

Chastelard, *Pierre de Boscobel de*, pē ār dē bōs'kōbēl shät-lār, French poet: b. Dauphiné 1540; d. 1563. He fell madly in love with Mary Stuart at the French court, and poured forth his admiration in innumerable poems. He figures as one of her escort on her return to Scotland after the death of her husband (1561). He had to return to France after this pleasing duty was performed, but on the first opportunity he was again in Scotland (1562). Mary gave him a very gracious welcome, answered, it is said, a poem dedicated to her, and allowed him to accompany her singing with his flute. Chastelard had the temerity one night to invade the royal bed-chamber. He was discovered, and ordered by the queen to quit the kingdom. Shortly after, however, he again concealed himself in a recess in her bedroom at Burntisland. For this offense he was tried publicly at St. Andrews and forthwith hanged, the queen resisting all appeals for pardon.

Chastelard, a tragedy published in 1869, by Algernon Charles Swinburne, the scene of which is laid at Holyrood Castle, during the reign of Mary Queen of Scots. The tragedy is conspicuously one to be read, not acted. It is too long, too much lacking in action, and of too sustained an intensity, for the stage. The style is essentially lyric, full of exquisite lines and phrases; and as a whole, the play presents an intense passion in a form of adequate beauty.

Chasteler, shät-lā, *Jean Gabriel*, MARQUIS OF: b. 1763; d. Venice 7 May 1825. He was grandee of Spain of the first rank, Austrian master of ordnance or general of artillery, military governor of Venice, and descended in a collateral line from the dukes of Lorraine. He received his first educa-

tion at Metz in the Collège de Fort. In 1776 he entered the Austrian service. After having served against the Turks, by whom he was severely wounded, he displayed his zeal for the house of Austria in the disturbances in the Netherlands. In 1796-7 he was employed in the negotiations of his court in Poland and Russia; was afterward with Suwaroff in Italy, where he distinguished himself in several engagements with the French armies. In 1808, with Hormayr, he was the soul of the famous insurrection in the Tyrol, and all the political as well as military events which were connected with it. Napoleon, enraged at the surrender of 8,000 French and Bavarians at Innsbruck, issued a proclamation at Enns, in which "a certain Chasteler who calls himself a general in the Austrian service, but who is the leader of a band of robbers, and the author of the murders committed upon the French and Bavarian prisoners, as well as the instigator of the Tyrolese insurrection," is declared an outlaw, and ordered to be brought before a court-martial and shot within 24 hours. The Emperor Francis commanded that an order which violated all international laws, and which was the more censurable as Chasteler had taken particular care of the prisoners and the wounded, should be met by retaliation. The Bavarian army, under the command of the marshal-duke of Danzig, entered Tyrol. Chasteler fearlessly encountered it, but his army was routed 13 May. After the close of the war he received several appointments, and in December 1814 was made governor of Venice.

Chastelet, shät lā, *Gabrielle Emilie Breteuil*, brè-tè-yēi, MARQUISE DU: b. Picardy 1706; d. Lunéville 1749. She was of an ancient family, was taught Latin by her father, Baron Breteuil, and was well acquainted with that language, but her favorite study was mathematics. She had a sound judgment and much taste, loved society and the amusements of her age and sex, but after the publication of the 'Philosophical Letters' by Voltaire had roused the Jesuits' criticism against him, she abandoned all these pleasures, and in 1733 retired with him to the dilapidated castle of Cirey, situated in a dreary region on the borders of Champagne and Lorraine. She embellished this residence, formed a library, collected instruments, etc. Cirey was often visited by the learned,—by Maupertuis, John Bernouilli, etc. Here the marchioness learned English of Voltaire in the space of three months, and read with him Newton, Locke, and Pope. She also wrote an analysis of the system of Leibnitz, and translated Newton's 'Principia' with an algebraic commentary. Voltaire lived six years with her at Cirey, where they employed their time in the study of science, and in getting up lovers' quarrels for the pleasure of patching them up again. At the end of this time she went to Brussels to prosecute a lawsuit, which was terminated by an advantageous compromise, brought about by Voltaire. She also carried on a correspondence with the German philosopher, Wolf, until her death. Her 'Traité de la Nature du Feu' obtained the prize of the Parisian Academy of Sciences, and is published in their collections. Her husband, the Marquis du Chastelet Lomont, was high-steward of King Stanislaus Lesczinsky at Lunéville.

CHASTELLUX — CHATEAUBRIAND

Chastellux, François Jean, från swå zhöñ shät lüks, **Chevalier de**, French historian: b. Paris 1734; d. Paris 28 Oct. 1788. He entered the army in 1749; distinguished himself as colonel in the Seven years' war, and later served in the American Revolution as major-general under Rochambeau, and gained the friendship of Washington by his amiable character. He published numerous works relating to the United States, including 'Voyage dans l'Amerique septentrionale dans les annees, 1780-1782'; 'Discours sur les avantages et les desavantages qui resultent pour l'Europe de la decouverte de l'Amerique'; and translated into French David Humphry's 'Address to the Army of the United States.'

Chasuble, chās'ū-bl, the outermost vestment worn by a priest in celebrating the mass: its name in Latin is *casula*, dim. of *casa*, house. In its original form it was a garment of circular or elliptical form like the South American *poncho*, with an opening in its centre through which the head of the wearer passes. But the form of chasuble now employed almost universally consists of a more or less oval front and back joined at the top, where is an opening to allow the head to pass through. The garment is usually of silk embroidered and decorated with gold or silver thread, and with a cross on the back. Chasubles of different colors, white (or cloth of gold) red, violet, green, black, are worn according to the occasion; as white on all high festivals, violet in penitential times, red on the anniversaries of martyrs, black in masses for the dead, etc. In the present form of the chasuble the priest's arms are free, whereas in the ancient form, the garment covered the person like a cloak.

Chat, a name given to various small passerine birds, chiefly of the genera *Saxicola* and *Icteria*; generally used with a prefix. The yellow-breasted chat (*Icteria virens*, with the western variety *longicauda*) is an aberrant member of the family of wood-warblers (*Mniotiltidae*), from the typical members of which it differs in its large size, robust build and stout bill. The sexes are similarly colored, being bright olive-green above, brilliant yellow on the breast and white on the belly, the sides of the head black with white markings. It is an abundant bird in thickets in the United States as far north as the latitude of Massachusetts, is migratory, and chiefly remarkable for its exceeding volubility and the incongruous admixture of sounds, natural and mimicked, of which its song consists. During the mating season the males indulge in the most extravagant aerial antics while singing, and often sing at night. See **STONE-CHAT**.

Chatard, Francis Silas Mareau, American Roman Catholic prelate: b. Baltimore, Md., 13 Dec. 1834. He was graduated from Mount Saint Mary's College, Emmitsburg, in 1853, and in 1856 took the degree of M.D. at the University of Maryland. After practising medicine a year, he entered the Urban College of the Propaganda, Rome, studied for the priesthood, and was ordained 14 June 1863, obtaining the degree of D.D., August 1863. In November 1863 he was appointed vice-rector of the American College, Rome, and in 1868 was promoted to the rectorship, the institution flourishing under his management. Later he was made

papal chamberlain to Pope Pius IX., who greatly esteemed him. On 26 March 1878 he was nominated bishop of Vincennes by Pope Leo. XIII., and consecrated in Rome 12 May 1878. The title of the see was changed from Vincennes to Indianapolis 23 March 1898. Bishop Chatard has translated works from the French, and is much interested in the cause of education. The diocese of Indianapolis has thrived under his care, and now (1905) has a Catholic population of 106,573; 202 priests; 153 churches; 4 seminaries; 102 parochial schools; 2 orphanages; 5 hospitals, and several charitable institutions.

Chateau-Lafitte, lä-fêt, **Chateau Latour**, and **Chateau Margaux**, famous vineyards, all in the department of the Gironde, France, furnishing the best of the red wines of Bordeaux. See **BORDEAUX WINES**.

Château-Thierry, tē-âr-rê, France, a town in the department of Aisne, on the right bank of the Marne, 38 miles south-southwest of Laon. It occupies the side of a hill, whose rocky summit is crowned by the ruins of the old castle of Thierry, said to have been built by Charles Martel, in 730. It is the birthplace of La Fontaine (to whom a fine marble statue has been erected), and was the scene of several conflicts during the campaign of 1814. On 9 Sept. 1870, it was occupied by the Germans, and became a few days later the temporary headquarters of the emperor. It possesses a court of primary resort and a communal college, and has manufactures of linen and cotton twist, and a trade in grain, wool, and cattle. Pop. (1891) 6,863.

Châteaubriand, François Auguste, från swå ô-güst shä-tō-brē-än, **VICOMTE DE**, French author and politician: b. St. Malo, Brittany, 4 Sept. 1768; d. Paris 4 July 1848. He received a commission in the army in 1788, and at the commencement of the Revolution he hurried into Paris to witness the great commotions then taking place there. In the spring of 1791 his ardent and enthusiastic spirit led him to join an expedition to America for the purpose of exploring its Arctic regions, and discovering the northwest passage. He crossed the Atlantic, landed at Baltimore, and proceeded to Philadelphia, where he had an interview with Washington. Returning to France in 1792 and married. Out of his American experience largely grew his 'Les Natchez' (see **NATCHEZ, LES**). He returned shortly after he quitted France and joined with other emigrants the Prussian army on the Rhine. At the siege of Thionville he was wounded in the thigh, and subsequently became an exile in England. Here his health gave way, and friendless and penniless he continued for a time to wear out a miserable existence in London. He at last found means of earning a subsistence by giving lessons in French and executing translations for the booksellers. In 1797 he published his 'Essai historique, politique et moral sur les Révolutions anciennes et modernes, considérées dans leurs Rapports avec la Révolution Française.' It was not intended with much success in England, and attracted no notice whatever in France. The essay is pervaded by a strong sceptical spirit in religious matters, but its author's views on this subject were soon to

CHATEAUDUN — CHATEAUGUAY RIVER

experience a sudden and important change. The death of his mother in prison, and the accounts of her last moments transmitted to him by his sister, who herself was no more by the time her letter reached her brother, made a lasting impression on the mind of Châteaubriand, and he became a firm believer in Christianity. In 1800 he ventured to return to France and take up his abode under an assumed name at Paris. Encouraged by the success of an essay on literature, contributed to the 'Mercure,' he published in 1801 his 'Atala,' which was afterward introduced as an episode into his 'Génie du Christianisme.' In the following year appeared his celebrated work 'Le Génie du Christianisme,' which may be said to have caused a religious reaction, and inaugurated a new period in the social history of France. The object of Châteaubriand was to demonstrate the superiority of Christianity over all other religions in a poetic and artistic, as well as moral and beneficial point of view. Though a work more brilliant than profound, it is unsurpassed for beauty of language and description and the eloquence of its impassioned appeals. The main charm indeed of the book may be said to lie in its beautiful imagery, drawn from external nature, and more especially from nature as exemplified in the glowing scenery of the New World. In this respect Châteaubriand may be said to have revived in French literature the description of natural scenery and objects which had long been almost unknown. His work attracted the attention and admiration of Bonaparte, and in 1803 he was appointed French minister for the Republic of the Valais. This office he resigned in 1804.

In order to give life and tangible form to the theories propounded in the 'Génie du Christianisme,' he commenced 'Les Martyrs,' and to qualify himself for describing accurately the scenes amid which the poem is laid, made a pilgrimage to the East. In 1809 'Les Martyrs' was published, and is considered by many the best of his works. Some of the descriptions, such as the ancient forests of Gaul, the assemblies of the Christians in the catacombs, and the picture of Rome under the emperors, are given with marvelous beauty and effect. In 1811 appeared his 'Itinéraire de Paris à Jérusalem.' The restoration of Louis XVIII. was hailed by him with enthusiasm, and a pamphlet entitled 'De Bonaparte et des Bourbons,' published by him in 1814, was said by the king to have been worth to him an army of 100,000 men. On the second restoration he preserved the title of minister of state, but refused to take office along with Fouché. On the accession of Villèle to power Châteaubriand was appointed ambassador to Berlin, then to London, and in September 1822, crossed the Alps to represent France at the congress of Verona. In 1824 he was summarily dismissed from office at the instance of Villèle, and the indignation which he felt at such treatment made him join the ranks of the opposition, where in the columns of the 'Journal des Débats' he fulminated attacks against government. On the accession of the Martignac ministry he again returned to office, and proceeded as ambassador to Rome, but resigned this appointment on Polignac becoming premier. On the revolution of 1830 he refused to take the oath of allegiance to Louis Philippe, and con-

sequently forfeited his seat in the house of peers and a pension of 12,000 francs. In 1831 a new work appeared from his pen, entitled 'De la Restauration, et de la Monarchie électorale,' in which occurs the following singular avowal: "I am a Bourbonist by honor, a royalist by reason and conviction, and a Republican by inclination and character." In the same year he published his 'Études ou Discours historiques sur la Chute de l'Empire Romain,' a work exhibiting more of the imagination of the poet than the critical acumen of the historian. Owing to several pamphlets of a legitimist tendency issued by him, he was arrested in 1832, but defended by M. Berryer, and acquitted. In the latter years of his life he published an 'Essay on English Literature,' a literal prose translation of 'Milton's Paradise Lost,' and other works. His memoirs appeared after his death, under the title of 'Mémoires d'outre Tombe.' They possess a great interest, and contain many charming passages, but are at times disfigured by the ebullitions of personal vanity, which formed one of the principal weaknesses of Châteaubriand. He was an intimate friend of the celebrated Madame Récamier, whose feeling toward him amounted almost to worship. Consult M. Lenormant, 'Châteaubriand et ses Mémoires,' and also works upon his life and literary work by Villemain and Saint Beuve.

Châteaudun, shä tō dën, France, a town in the department of Eure-et-Loire, 26 miles south-southwest of Chartres, near the right bank of the Loire. Its streets are straight and terminate in a square, from which a complete view of the town may be obtained. The hôtel de ville and college buildings are deserving of notice. The old castle of the counts of Dunois overlooks the town. Châteaudun has manufactures of blankets, and large tanneries, and some trade in agricultural produce. In the Franco-German war the town was captured by the Germans (18 Oct. 1870), who held it till 9 November, when they were driven out by the French; it was, however, recaptured some few days after. Pop. (1891) 7,147.

Chateauguay (shät-ō-gā') **River**, Lower Canada: operations on in the War of 1812; and battle of 25 Oct. 1813. (For the previous operations in the campaign against Montreal, see **CHRYSTLER'S FARM**.) Gen. Wade Hampton had been for some months in command at Burlington, Vt., when Wilkinson ordered him to advance on Montreal; ostensibly to co-operate with himself, though he had not yet started down the St. Lawrence. Hampton moved to the Canada line; then, finding that a drought had impaired the water supply on the straight road, marched westward to Chateauguay, N. Y., some 50 miles from the mouth of the Chateauguay River, an affluent of the St. Lawrence. He remained there three weeks, menacing the British communications and opening up his own, building roads, getting up supplies and artillery, etc. On 16 October Armstrong ordered him to approach the river-mouth for convenient junction with Wilkinson; and on the 22d-24th he established himself at Spear's, about 15 miles from the mouth. He had some 4,000 raw troops and 200 dragoons. Prevost had about 15,000 around Montreal, and the river lined with gunboats and batteries, while Hampton had not even

CHATEAUNEUF DE RANDON — CHATELET

transports, and was in the heart of a hostile country. Prevost could have captured his whole army without much trouble; but he was really alarmed that Hampton was excellently posted to threaten the communications and supplies on the river. When Hampton advanced to Spear's, the British militia there retired; but Lieut.-Col. de Salaberry with 800 regulars intrenched himself in front on the road to the St. Lawrence, and filled the road with abattis. Hampton felt it needful to restore his communication with the river, and on the night of the 25th sent a strong flanking party around, while he himself attacked Salaberry in front. The former lost his way, and on this account he did not press his own attack. He lost 50 men, the British 25. Just then he received a message to prepare winter quarters; and feeling sure the campaign was to be abandoned, fell slowly back to Chateauguay, unmolested by Prevost. A week later he received a request from Wilkinson to send supplies forward and march down the river: he replied that he had none to send, and as Wilkinson evidently had not enough to sustain a forward movement, he should fall back to Plattsburg. Wilkinson received the message the day after his defeat at Chrystler's, and at once went into winter quarters.

Chateaneuf de Randon, shä-tō-néf-dè-rän-dõn, France, a small town in the department of Lozère, 12 miles northeast of Mende, on a hill. It was formerly fortified, and is celebrated for the four years' siege sustained by the English garrison in 1380, against the troops of Charles V., commanded by the chivalrous Duguesclin. During this siege the English governor, who had been hard pressed, promised to surrender to Duguesclin at the expiration of 15 days, if no succor arrived. Before the end of the time agreed upon Duguesclin died, when his successor summoned the governor, who replied that he had given his word to Duguesclin, and would yield to no other. Informed of the hero's death, he said, "Then I will carry the keys to his tomb." Accordingly the governor sallied forth with the garrison to Duguesclin's tent, and on his bended knees laid his sword and the keys of the town on the bier. In 1820 a simple commemorative monument was erected at the hamlet of Bitareüle, on the spot where this event occurred. Pop. 3,541.

Châteauroux, shä-tō-roo, France, capital of the department of Indre, 144 miles south-southwest of Paris, in an extensive plain, left bank of the Indre. It has straight, broad, and tolerably well-paved streets, and spacious squares, with a public garden, and some fine promenades. The cloth manufactures, in which the wools of Berry are almost exclusively used, are extensive, employing about 2,000 workmen. Cotton hosiery, woolen yarn, tiles, paper, and parchment are also made; and there are tanneries and dyeworks. There is likewise a considerable trade in grain, wine, iron, wool, poultry, and cattle. The town owes its origin to a castle built in 950 by Raoul le Large, of Déols, still in a tolerable state of preservation. It was considerably extended in the reign of Louis XIII., who constituted it a duchy in favor of the descendants of Henry II. of Bourbon, prince of Condé. Charles of Bourbon sold it to Louis XV., who conferred it on one

of his mistresses, at whose death it returned to the crown. During the revolution of 1793 it was called Indreville. Pop. (1896) 23,863.

Chatelain, shä-të-län. See CASTELLAN.

Chatelard, shä-të-lär. See CHASTELARD.

Châtelet, shä-të-lä, Belgium, a manufacturing town in the province of Hainaut, on the Sambre, five miles east of Charleroi. Its chief industries are the manufacture of cotton-stuffs, knives, nails, and pottery. Pop. (1897) 11,255. Châtelineau, opposite to it, has a pop. of (1897) 11,519.

Châtelet was anciently a small chateau or fortress, and the officer who commanded it was called *châtelain*. The word is a diminutive of *château*, formed from *castellum*, a diminutive of *castrum*; or from *castellatum*, a diminutive of *castellum*, castle. The term, in later times, has been applied to certain courts of justice, established in several cities in France. The Grand Châtelet, in Paris, was the place where the presidial or ordinary court of justice of the prévôt of Paris was kept, consisting of a presidial, a civil chamber, a criminal chamber, and a chamber of police. The term signified the same at Montpellier, Orleans, etc. When Paris was confined to the limits of the old city (*cité*), it could be entered only by two bridges (Le Petit Pont and Le Pont au Change), each of which was fortified with two towers—a smaller one in the wall, facing the city, and a larger one before the bridge, toward the country. These two exterior turrets were the Grand and Petit Châtelet. The tradition that the Grand Châtelet was built by Julius Cæsar, though adopted by some, is not well supported; but it is certain that the great tower was standing as early as the siege of the city by the Normans (885). The Grand Châtelet was the castle of the counts of Paris, and therefore the seat of all the royal courts of justice within the city and county, and also of the feudal court. The city had no proper jurisdiction whatever; its bailiff or provost (*prévôt*) was appointed by the king, and was president of the court (though only nominally, because he had no voice in the judgments), and, by virtue of his office, leader of the nobility. The office of provost of the merchants (*prévôt des marchands*; in other cities *maire*), established before the former, and afterward united with it for a time, was finally separated from it in 1388. The business of the Châtelet was transacted by the deputies of the bailiff (*lieutenants*), of whom there were five, three for civil causes, one chief judge of criminal cases, and a lieutenant-general of police (*lieutenant-général de la police*). The latter, indeed, was minister of police for the whole kingdom, and at the extent of his functions and power, particularly after the new arrangement made by the celebrated d'Argenson under Louis XIV., rendered him one of the most important officers of the state. In the Châtelet, however, he held only the fourth place. The whole court of justice was composed of 57 counselors, with 13 state attorneys, and a multitude of subalterns, as 63 secretaries or *greffiers*, 113 notaries, 235 attorneys, etc. All these offices were sold. The place of the first officer of the civil chamber was rated at 500,000 livres; that of a notary at 40,000 livres. The Châtelet was first in rank after the supreme courts (*cours souveraines*).

CHATHAM

Chatham, chăt-ăm, **William Pitt**, EARL OF, English statesman: b. Westminster 15 Nov. 1708; d. Hayes, Kent, 11 May 1778. He was educated at Eton and Oxford. On quitting the university he became a cornet in the blues, and in 1735 represented the borough of Old Sarum (the property of his family) in the House of Commons, where he attracted universal notice. He was a powerful opponent of Sir Robert Walpole, who revenged himself by taking away his commission. In January 1741, he delivered the speech reported by Johnson for the 'Gentleman's Magazine,' beginning, "The atrocious crime of being a young man, which the honorable gentleman has with such spirit and decency charged upon me, I shall neither attempt to palliate nor deny." But it is probable that there is more of Johnson than of Pitt in it. In 1744 he received, on account of his patriotism, a legacy of £10,000 from the Duchess of Marlborough; became in 1746 vice-treasurer of Ireland, paymaster-general of the army, and member of the privy council. In 1755 he resigned the paymaster's office. In 1756 he was appointed secretary of state, but was dismissed the same year on account of his opposition to the Hanoverian policy of George II. The nation, however, was enthusiastically attached to him, and the public discontent was so loudly manifested, that he was appointed secretary of state again in 1757. His great mind now revealed its full force. His ascendancy was complete over the Parliament no less than in the ministry; he aroused the English nation to new activity. In 1760 he advised the declaration of war against Spain while she was unprepared for resistance, as he foresaw that she would assist France. The elevation of England on the ruins of the house of Bourbon was the great object of his policy. But his plans were suddenly interrupted by the death of George II. George III. was prejudiced against Pitt by his adversary, the Earl of Bute, a statesman of limited views. Pitt therefore resigned his post in 1761, only retaining his seat in the House of Commons. On his retirement his wife was created Baroness Chatham. In 1762, when Spain formally allied herself with France, Pitt urged the continuance of the war, by which both states would perhaps have been totally exhausted; but peace was concluded by the opposite party in 1763. Pitt uniformly supported the cause of the people. Foreseeing the separation of the American colonies from the mother country, if the arbitrary measures then adopted should be continued, he advocated, especially in 1766, a conciliatory policy, and the repeal of the Stamp Act. In the same year he was invited to assist in forming a new ministry, in which he took the office of privy-seal, and was created Viscount Burton, Baron Pensent, and Earl of Chatham. In 1768 he resigned, but in the House of Lords continued to recommend the abandonment of the coercive measures employed against America, particularly in 1774. His warning was rejected, and in 1776 the colonies declared themselves independent. In vain did he renew his motion for reconciliation in 1777; in vain did he declare the conquest of America impossible. On 7 April 1778, though laboring under a severe illness, he repaired to the House, to attack the unjust and impolitic proceedings of the ministers toward the colonies. At the close of his speech he fainted and fell backward; he was conveyed out of the House, and afterward removed to his

country-seat at Hayes, in Kent, where he died a month later. The Parliament annexed an annuity of £4,000 to the earldom of Chatham, his debts were paid, and he was honored with a public funeral, and a magnificent monument in Westminster Abbey. Another was erected in 1782 in Guildhall. His popularity in America was very great and several localities were named Chatham in his honor, as well as Pittsburg, Pa., and Pittsfield, Mass.

Chatham, Canada, county-seat and port of entry of Northumberland County on the right bank of the Miramichi River, 12 miles from its mouth and one mile from Chatham station on the Chatham branch of the Canadian Eastern Railway in New Brunswick. It is on a branch of the Intercolonial Railway, 98 miles northeast of Fredericton. It is the largest town on the north shore of the Province. The harbor accommodates ships of large draught; and it has an important export trade in fish, tanning bark, deals, lath, and finished lumber. Its manufactories are lumber, flour, carriages and other vehicles, springs and axles, rock wall mortar, incubators, stationary engines and pumps. There are foundries and machine shops, a large cooperage and lumber mill and a large fanning mill factory. The town has many handsome buildings, including two large hospitals, a very fine Central High School, and the Ursuline Academy. It also has a Carnegie Free Library and includes Tecumseh Park with some beautiful scenery. It is called the "Maple City," and was incorporated in 1855. Pop. (1901) 6,624.

Chatham, Canada, city and county-seat of Kent County, Ontario, on the Thames River, the Grand Trunk, and the Lake Erie and Detroit River railways, 45 miles northeast of Detroit and 67 miles southwest of London. The Thames is navigable for steamboats from Lakes Erie and Huron. It is the trade centre for a rich agricultural, fruit, and stock-raising district, and exports large quantities of grain, lumber, railroad ties, cordwood, potash, tobacco, soap, and pork. It is the seat of a United States consul. It has large saw, flour, and woolen mills; foundries and machine shops; manufactories of wagons and carriages, soap, candles, potash, and tobacco; and breweries and distilleries. Pop. (1901) 9,068.

Chatham, England, now a parliamentary and municipal borough, naval arsenal, and seaport, in county Kent, on the Medway, about 33 miles by rail from London, practically forming one town with Rochester. As a parliamentary borough it includes Gillingham and New Brompton, and returns one member. The great features of Chatham are the naval and military establishments here and in the vicinity. The dockyard was founded by Queen Elizabeth previous to the period of the Armada, and during this reign Upnor Castle, on the left bank of the Medway, was erected to protect the dock and shipping. Despite the fire from the castle, however, in 1667, Van Ghent, a vice-admiral of De Ruyter's, succeeded in breaking the chain stretched across the river, burned and sunk several ships, and retired bearing off the warship, the Royal Charles, as a prize. Subsequently the fortifications were greatly strengthened and enlarged, but the great increase in the power of

CHATHAM ISLAND — CHATSWORTH

modern ordnance having rendered parts of the works of little value, a number of out-lying forts have had to be built. With its modern extensions the royal dockyard now extends for about two miles along the river, and is most thoroughly equipped for the building, fitting out, and repairing of war vessels. Among recent additions are three basins for iron-clad war-ships, with a total area of about 75 acres. One of these, the repairing basin, has an area of 22 acres, and is connected with four dry-docks. It has 3,500 feet of wharfage, is 80 feet wide at the entrance and about 30-32 feet deep at high water. The largest, or fitting-out basin, has a water area of 33 acres, with 5,800 feet of wharfage, and a depth of 30 feet. From it the heaviest war-ships fully equipped are able to proceed direct to sea. The factory basin (20 acres area) is intended for fitting vessels with their engines, etc. The engine factories and machine works on the south side of this basin are about 2,500 feet long, and occupy about 14 acres. The cost of these works was nearly \$15,000,000. The largest class of iron-clads are built here. There are several covered slips for building ships upon, the iron roofs of some costing \$50,000. The rope-house has a length of 1,200 feet; there are great saw-mills, and the forges turn out armor plates, anchors, and other articles required for the battle-ships of the present day. In short, all the requisites of a great naval station are here on the most complete scale. The military establishments include extensive infantry barracks, and barracks for the royal marines; the headquarters of the royal engineers, arsenal and park of artillery, hospitals, etc. The whole is surrounded by a very extensive system of fortified works, rendering Chatham a place of great strength. The old convict prison has been partly pulled down and replaced by naval barracks. The fortifications are regarded as a defense for London, a protection against an invasion from the south coast. Chatham is one of the chief ship-building towns of England; but the people do not forget the noted dead of the nation. A statue to Lord Waghorn reminds them of his work on the "overland route" to India, and a monument to Gordon represents him as an explorer. Charles Dickens lived some time in Ordnance Place, Chatham. Pop. (1901) 78,746. of the parliamentary borough.

Chatham Island, the most important of the Galapagos archipelago (q. v.); 600 miles from Ecuador, which owns the group, and uses Chatham, Charles, and Albemarle as penal settlements for political offenders. Its interest to Americans lies in the negotiations opened with Ecuador in March 1900, to buy it for a Pacific coaling station.

Chatham Islands, in south Pacific Ocean, belong to New Zealand. The group, three in number, are in lat. 44° 7' S.; lon. about 176° 49' E. The group is of volcanic origin. Chatham, the largest island, is about 38 miles long and 25 broad. The other islands are Pitt Island, 12 miles long by 8 broad; and Ranga Tira, a mere rock. The harbor of Waitangi, on the west side of Chatham Island, is much frequented by whaling vessels, which there supply themselves with fuel, provisions, and water. There are few hills in the island, and the highest does not exceed

800 feet. In the interior of the largest island is a brackish lake. The soil is in many places fertile, and crops of potatoes and wheat have been successfully and extensively cultivated and exported. Turnips, cabbages, pumpkins, and tobacco are also successfully cultivated. The creeks and shores abound in fish, many of them excellent; sharks of formidable size are numerous. Stock raising and seal fishing are prominent industries. The original inhabitants, now nearly extinct, are a cheerful and good-natured race. About the year 1830 they amounted to some 1,200, but they now number little more than 30. The destruction of this unfortunate people is attributed to the cruelty and tyranny of the New Zealanders, a number of whom migrated to the island in 1836, and by the superior energy and ferocity of their character soon became masters of the inoffensive aborigines. The present population amounts to about 400, more than half of whom are Maoris. The Chatham Islands were discovered by Lieut. William Robert Broughton, of H.M. brig Chatham, and taken possession of by that officer in name of his Britannic majesty, 29 Nov. 1791.

Chati, chă-tē, a wildcat (*Felis mitis*) ranging from Mexico to Paraguay, in warm lowlands and woods. The body, including the head, is from 24 to 27 inches long, the tail about 14 to 18 inches. The fur is soft and tawny, spotted with black. This cat is by some naturalists considered a variety of the margay (q. v.).

Chatillon - sur - Seine, shă-tē-yôn-sūr-sân, France, department of Côte d'Or, 45 miles northwest of Dijon, on the Seine. Pop. (1896) 5,000.

Chat'moss, an extensive morass, area about 6,000 to 7,000 acres, situated chiefly in the parish of Eccles, Lancashire, England. It is remarkable as being the scene of operations for reclaiming bog-land, first successfully carried out on a large scale in the end of the 18th and beginning of the 19th century; also for offering one more field of triumph to George Stephenson, who carried the Liverpool & Manchester Railway over it after all other engineers had declared the feat impossible. Stephenson spread branches of trees and hurdles interwoven with heather on the surface of the bog, and placed a thin layer of gravel over all; upon thi sleepers and rails were laid in the ordinary way.

Chatoyancy, or **Change of Colors**, is the property possessed by a few minerals of displaying different colors by reflected light, when the specimen is revolved. Thus labradorite ordinarily has a dull gray color, but when revolved, a position will be reached in which the surface of the specimen will exhibit great sheets of gorgeous blue, green or copper-red colors. The cause of the phenomenon differs in the several minerals showing it. In the case of labradorite it is apparently due to interference, while in tiger-eye (q. v.) it is the result of the fibrous structure. The beautiful chatoyancy of cat's-eye (q. v.) usually due to enclosed fibers of asbestos or other fibrous minerals, is more properly regarded as opalescence. Compare also **PLAY OF COLORS** and **SCHILLER**.

Chatrian, shă-trē-än, **Alexandre**. See ERCKMANN, EMILE.

Chats'worth, England, the celebrated estate of the Dukes of Devonshire, situated in the

CHATTAHOOCHEE — CHATTANOOGA

parish of Edensor, in Derbyshire. It was among the domains given by the Conqueror to his natural son, William Peveril. It was purchased in the reign of Elizabeth by William Cavendish, who commenced to build a mansion on it, which was completed by his widow, the Countess of Shrewsbury. The present building was nearly completed by the first Duke of Devonshire, and a new wing was added by the sixth Duke. The façade is 720 feet long, or with the terraces, 1,200 feet. The mansion forms a square, with an inner court, and is remarkable for the collections of pictures and statues it contains. The park is about 11 miles in circumference. The grounds have been laid out by Loudon and Sir J. Paxton. The conservatory covers nearly an acre, and is 65 feet high. In the old building Mary Stuart was imprisoned for 13 years. Hobbes, the philosopher, lived for some time here.

Chattahoo'chee, a river in the northern part of Georgia, rising in the Appalachian Mountains, and flowing first west and then south, forming, for a considerable distance, the boundary between the above State and Alabama. In its lower course, after the junction of the Flint River from the east, it is named the Appalachicola, and is navigable to Columbus for steamboats. Total course, about 550 miles.

Chattahoo'chee Stage, in American geology, the lower rocks laid down in older Miocene time along the Atlantic coast of what was then the continent of North America. Strata of this stage probably extend, except for a break in Maryland and Virginia, from Cape Cod to Texas, and in the north are clays and uncompacted sand, changing to limestones in the south. The typical exposures of the Chattahoochee stage are on the Chattahoochee River in southwest Georgia and northwest Florida. Here are beds of clay, marl, and limestone about 200 feet thick. The Chattahoochee stage corresponds in age to the John Day beds in Oregon, and to some of the Miocene gold-bearing gravels of the Sierra Nevada. See **MIOCENE SERIES; TERTIARY SYSTEM.**

Chattanooga, Tenn., a city and county-seat of Hamilton County, an important railroad, trade, and manufacturing centre, on the south bank of the Tennessee River, and on the Southern, Central of G., Nashville, C. & St. L., Cincinnati, N. O. & T. P., Alabama G. S., and other R.R.'s. It is situated near the Georgia and Alabama boundaries, at the base of the Cumberland plateau, 698 feet above the level of the sea. It is the centre of, and the largest place in, the quadrangle formed by Nashville, and Knoxville, Tenn., Birmingham, Ala., and Atlanta, Ga., distant respectively 151, 112, 143 and 137 miles. The district around as the gateway of the Cumberland range between the three States, was one of the greatest strategic points during the Civil War, and is historic for many bloody and famous battle-fields. To the southwest is Lookout Mountain, commanding a superb view of six or seven States; on the east is Missionary Ridge; and south by east, a few miles away in Georgia, is the field of Chickamauga, now turned by the government into a national military park—to be also the seat of a permanent army post, where several thousand State militia are to be exercised yearly in evolution by regular army officers. The Seventh United

States Cavalry is stationed there, and barracks are under construction. At the southeast corner of the city itself is a national cemetery, one of the largest in the country, containing 13,362 graves. The whole region is a noted tourist resort, for historic and scenic reasons. The finest structures in the city are the custom-house of marble, and the *Times* building. The Baroness Erlanger Hospital is the most noted charitable institution. For higher education, it contains the U. S. Grant University, the Chattanooga Medical College, and the Chattanooga Normal University. There is also a public library, to which Mr. Andrew Carnegie has donated \$50,000 for a library building.

Trade and Manufactures.—The river here is navigable eight months in the year, and the Muscle Shoals Canal gives unbroken passage to its mouth by the Chattanooga & Tennessee River Packet Company; while northeastward, steamers run to Kingston, and at high water to Knoxville, 200 miles, by water. But the great and growing importance of Chattanooga is in manufacturing, which it owes to the adjacent deposits of coal, iron, clays, and many other minerals, and the forests. It has a larger variety of small manufactures than any other Southern city, and some of great magnitude. The chief are iron and iron goods, flouring and grist-milling, lumber and furniture, and patent medicine. The first of these in 1900 produced \$2,553,422 worth of goods; the second \$2,287,268; the third \$922,009. It has the largest manufacture of steam boilers in the United States, next to Erie, Pa.; the largest steel-roofing, wagon, furniture, refrigerator, hosiery, and patent-medicine works in the South; the largest oak-bark tanning and metallic paint works in the United States, and the largest manufacture of kitchen furniture, iron soil-pipes, acetylene gas-burners, slate-pencils, and curtain poles in the world. In 1900 there were 332 plants, producing goods to the total value of \$12,033,780; there are now 370; and the increase of employees is said to have been 20 per cent since 1900. There are seven banks in the city, with deposits of over \$6,250,000, and five of them are in a clearing-house.

Government and Finances.—There is a two-years' mayor and a bicameral council. The annual outlay is about \$300,000, the heaviest item in 1902 being \$48,500 for schools. In 1902 the assessed valuation was \$14,000,000, the debt \$931,000, and the municipal tax-rate \$14.50 on a thousand.

Population and History.—Chattanooga, originally called Ross Landing, first appears in the census in 1860 with 2,545 people. In the War, being a storm centre, it was nearly destroyed; but as in the case of some other southern cities, the War was its making. It was an important military post, and the iron industry started in a rolling-mill opened in order that the ruined railroads might be rebuilt. The attention of capital had also been called to its great advantages of situation. In 1870 it had a population of 6,093; in 1880, 12,892; and in 1890, 29,100. The growth of the city was retarded by the general business depression which followed the financial reverses of 1893; but a revival came with the concentration of some 70,000 soldiers there in 1898, and the consequent immense disbursements. Since then it has been rapidly moving forward; and though the Federal census of

CHATTANOOGA

1900 shows 30,154, it is claimed that the corporate limits, which are less than four square miles, are too restricted, and that the addition of the 22 suburbs belonging to it would raise the population to nearer 55,000. The increase in school attendance, in post-office receipts, etc., has been very large in the past three years.

B. L. GOULDING,
Vice-President Chattanooga Library Association.

Chattanooga, Battle of. At the close of the battle of Chickamauga, Ga., 20 September, the Union army, in withdrawing from the field, having interposed at Rossville, Ga., between

Missionary Ridge the same distance east of it, the mountain and the ridge being parallel, running nearly north and south and about four miles apart. The Tennessee River touches the base of Lookout. The city lies to the northeast in a great bend of the river. The advance line of the Confederates was half way between the ridge and the city, upon a low intermediate ridge, at the right of which was Orchard Knob, an isolated knoll rising some 60 feet above the plain.

Lookout Mountain commanded the river line to Bridgeport and Stevenson, the main depots



CHATTANOOGA, TENN.,
AND VICINITY.

Bragg and Chattanooga, advanced into that city the night of the 21st and morning of the 22d, and immediately began to fortify it. Bragg followed on the 22d, and his lines were soon established in front of the place, his left resting on the Tennessee River and Lookout Mountain, below the city, his centre extending across the plain to the foot of Missionary Ridge, his right being established at the foot of the ridge and reaching toward the Tennessee River above. The north point of the Lookout Mountain range is three miles southwest of Chattanooga, and

of supply. This necessitated a wagon-haul of 60 miles over the Cumberlands and the adjacent range of Walden's Ridge, all precipitous and barren mountains. The Union army was soon running short of supplies, the fall rains rendering the roads almost impassable. On 19 October, the day that Rosecrans had perfected the general features of a plan for regaining the river line of supplies, he was relieved from command and Gen. Geo. H. Thomas assigned, who at once ordered the preparations inaugurated by Rosecrans to go forward.

CHATTANOOGA

Immediately after the battle of Chickamauga Gen. Hooker with the Eleventh and Twelfth corps was sent from the army of the Potomac and arrived at Bridgeport, Tennessee, 30 September. Sherman, in camp east of Vicksburg, had been ordered up with four divisions. Grant was sent to take general command. Upon arriving, 23 October, he approved the plans for opening the river, and directed their execution. Gen. Hooker was to advance into Lookout Valley, and a co-operating force from Chattanooga under Gen. W. F. Smith was to seize Brown's Ferry below Lookout Mountain, throw a bridge there and form a junction with Hooker. These movements were successfully executed during 27 and 28 October. The Eleventh corps (two divisions) and Geary's division of the Twelfth corps entered Lookout Valley the afternoon of 28 October, the Eleventh corps proceeding to Brown's Ferry and formed a junction with Gen. Smith's troops from Chattanooga. Geary, with six regiments of his division, halted near Wauhatchie Station. At midnight of the 28th Geary was attacked by Jenkins' (Hood's) division, six regiments, of Longstreet's corps, supported by Law's division. Schurz's division coming to Geary's support, Longstreet's troops after three hours' fighting withdrew to the east side of Lookout, and the Wauhatchie or Lookout Valley remained thereafter in Union control. Abundant supplies by the river then reached Chattanooga by a short wagon-haul from Brown's Ferry. On 4 November, shortly after the battle of Wauhatchie, Longstreet's corps was detached by Bragg and sent to Knoxville.

The battle of Chattanooga, which occurred three weeks later, embraced three days' operations, 23, 24, and 25 November. At the opening Bragg's lines were as already described. Hooker, with Geary's division and Cruft's from the Fourth corps of the Army of the Cumberland, occupied Lookout Valley, the Army of the Cumberland and the Eleventh corps were on the lines about Chattanooga, and Sherman with three divisions had crossed at Brown's Ferry and was concealed behind the hills above Chattanooga and on the opposite side of the river from the city.

Gen. Grant's force for his firing lines was about 60,000, and the Confederates' a little less than 40,000. The formidable natural positions of the latter were held to give them superior advantages.

Grant's plan of battle was for Hooker to hold Lookout Valley against Bragg's left. Sherman was to cross the Tennessee opposite the north end of Missionary Ridge, which was unoccupied, and carry it to the railroad tunnel about half a mile south of its northern end. Sherman, then, astride of the ridge, was to move south; while Thomas, with the Army of the Cumberland before the city, was to connect its left with Sherman's right, and together sweeping south they were to clear the ridge and the valley. As the engagement progressed, every feature of this plan was changed by unexpected developments.

At noon, 23 November, Gen. Thomas, being directed by Grant to ascertain if the Confederates still occupied their lines and camps between the city and Missionary Ridge, paraded five divisions in full view of the Confederate positions, which, as was afterward ascertained,

was at first supposed to be a review. Wood's division was in the centre advanced, Schurz's and Steinwehr's divisions of the Eleventh corps were refused on the left, and Sheridan's and Baird's on the right. At a bugle signal at 1:30 P.M. the centre advanced rapidly, and, after a sharp contest, captured Orchard Knob, and forced the abandonment of the entire line of the Confederates through the centre of the plain, reversed the works at and near the Knob and held them. This was the first day's battle.

The night of the 23d Sherman with three of his four divisions which had reached his concealed camps opposite the city and north of it, marched to the North Chickamauga, where 116 pontoon boats awaited him. These were filled with soldiers, floated down the creek to the river, and thence to the opposite shore, and by daylight of the 24th 8,000 of Sherman's troops were in line fronting Missionary Ridge, two miles from it, and opposite its northern extremity, which point was not occupied by the Confederates until 2:30 in the afternoon. At 1 o'clock the three divisions, and one from the army of the Cumberland which had covered the movement having crossed, the lines were advanced, and at 4 o'clock a range of unoccupied hills north of and overlooking the north end of Missionary Ridge was occupied without resistance, and strongly intrenched under the supposition that these formed the north end of the ridge contemplated in the order of battle. The mistake was due mainly to the misty weather, and the omission of any reconnoissance.

At 2:30 P.M. Cleburne's division arrived at the north point of the ridge and entrenched.

Gen. Thomas, having obtained Grant's permission to make a demonstration against the Confederate position on Lookout, Hooker made ready to move at an early hour on the 24th.

The Confederates held the top of the mountain, which was a narrow plateau 1,700 feet above the valley, protected by perpendicular palisades varying from 75 to 250 feet high. From the foot of these walls of rock the mountain sloped westward to Hooker's position in Lookout Valley eastward to the plain south of Chattanooga, while its north slope descended to the Tennessee River opposite Moccasin Point. It was approximately a mile and a half from the foot of the palisades to the valley. The battle took place on these slopes. No Union troops reached the top of the mountain during the engagement. The morning of the 24th, Brown's and Pettus' brigades of Stevenson's Confederate division, with a battery of four Napoleons, occupied the summit, and Walthall's and Moore's brigades of Cheatham's division the slopes of the mountain, Walthall's holding the western slope and Moore's the northern.

Hooker's forces consisted of three brigades of Geary's division of the Twelfth corps, two brigades of Cruft's division of the Fourth corps, and two brigades of Osterhaus' division of Sherman's army. This latter division had been prevented from following Sherman over the river by the breaking of the pontoon bridge at Brown's Ferry. Hooker's aggregate strength was something over 9,000. Walthall's brigade, which sustained almost the entire attack until the western and northern slopes had been carried, did not number over 1,700. There were 250 men of Moore's brigade on picket, which were mostly captured early in the engagement.

CHATTANOOGA

The head of Hooker's column crossed Lookout Creek at Light's Mill near Wauhatchie, at 8 o'clock in the morning, and, concealed by the fog which hung over the mountain, marched directly up the western slope until the head of the line reached the base of the palisades. His line then faced toward the north point of the mountain, distant about two miles.

After an advance of a mile and a half with Geary's brigades, Cobham's, Ireland's, and Candy's, in advance, and Whitaker's of Cruft's division in reserve, the troops struck the left flank of Walthall's line protected by slashed timber. This was carried, and in the face of stout resistance the Confederates were driven around the north point of the mountain, and across its northern slope. As Geary's attack opened, first Grose of Cruft's division and next Wood and Williamson of Osterhaus', successively joined the left of the lines, and advanced with the swinging movement on the slopes of the mountain. Until the northern slope had been carried to the Craven House, Walthall had no assistance. Moore advanced as he was being pushed back from the Craven House, but was immediately repulsed. Pettus arrived at one o'clock and relieved Walthall after he had withdrawn some 400 yards from the Craven House. This enabled Walthall to procure ammunition, re-form, and take his place on the line again. This position was held until three o'clock in the morning, when, the troops and supplies from the top having been withdrawn and safely started across the plain for the Missionary Ridge line, this final line was also withdrawn, and the mountain abandoned. The troops on the summit, on account of the fog, could do little damage to the Union lines. Hooker was materially assisted by batteries on the elevated points in Lookout Valley, and those across the river on Moccasin Point, which swept the northern slope. The next morning the Union forces occupied the summit.

The capturing of Lookout Mountain decided Gen. Bragg to withdraw his whole army from the plain to the crest of Missionary Ridge, except as heavy picket forces were left in the entrenchments at the base of the ridge.

Hooker's losses at Lookout, and the next day at Missionary Ridge, which were small but not definitely reported, were: Killed, 81; wounded, 390. The Confederate loss was: Killed, 21; wounded, 177. Walthall lost 845 captured, mostly from his long picket line at the base of the mountain. Moore's missing were 199, and Pettus' 9.

During the night of the 24th and the early morning of the 25th, Bragg concentrated his army on Missionary Ridge, and in the earthworks at its base. This was his first occupation of the crest of the ridge in force. His new line extended from Rossville, a distance of eight miles to the north end of the ridge, his divisions from Rossville northward being Stewart's, Breckinridge's (Bate's), Hindman's (Patton Anderson's), Cheatham's, Walker's, Stevenson's, and Cleburne's.

The battle of the 25th opened soon after seven o'clock by an assault of Sherman upon the north end of the ridge, defended by Cleburne. Sherman's force consisted of his own divisions of Morgan L. Smith, Hugh Ewing, and John E. Smith, with the divisions of Jeff. C. Davis from the Army of the Cumberland, and Schurz and Steinwehr of the Eleventh corps. While the

four brigades of Corse, Matthies, Raum, and Giles A. Smith reached the crest at different periods, none was able to maintain position there, though Corse and Smith held on stubbornly under the crest until toward evening, when all were driven from the slopes. The fighting of the troops sent in was persistent and most courageous, but Cleburne, at first alone, and later supported by Stevenson's division and a part of Walker's, repulsed all assaults. The last one, about 3:30 p.m., was especially serious.

Grant, on Orchard Knob, observing this repulse, ordered Gen. Thomas to advance his four divisions at the centre against the earthworks at the foot of the ridge as a diversion in favor of Sherman, hoping thereby to cause the withdrawal of Confederate forces from his front. The four divisions which were ranged along the Orchard Knob line were, from left to right: Baird, Wood, Sheridan, and Johnson. The line was two and a half miles long, and faced the ridge at distances from three quarters of a mile to a mile from it. There were 11 brigades and 89 regiments in the lines as prepared for the assault. The formation was such as to present the appearance of being four lines deep. At a signal of six cannon shots from Orchard Knob the four divisions rushed for the earthworks at the foot of the ridge. On the summit opposed to this advance were 13 brigades and 16 batteries. The cannonading of nearly 100 guns from the crest was terrific, and the line was soon under rifle-fire from the works at the base, but the entire line of earthworks was captured as soon as the troops by running could reach them. Reforming their lines in the earthworks, Baird's division on the left and Johnson's on the right began the storming of the ridge without further orders. In Baird's division the horses of field officers had been left behind at the start, because as he announced he had intimations that the intention was to go to the summit, and it was easy to see that the slopes were too steep for mounted men to ascend. In the same way Johnson's men were informed at the start that the movement was to be an attack on the ridge. At the centre in Wood's and Sheridan's divisions the orders as understood by most were to stop at the rifle-pits, but the men ignored these and started forward, and soon orders were received to go to the top. The whole line of brigades gained the crest so nearly together that it has always been difficult to determine which, if any one, was the first.

The long lines of the storming party moved up the slopes with few checks, and in an hour had carried three miles of the crest and captured 37 guns and about 2,000 prisoners.

Just as the orders were given Thomas for this assault at the centre, Hooker, who had descended Lookout at one o'clock and started to attack the south end of the ridge in Rossville Gap, reached that position. He had been detained by the necessity of rebuilding a bridge over Chattanooga Creek. He at once sent Osterhaus' division through the gap and turned it north along the east side of Missionary Ridge. Cruft's division assaulted and carried the south end of the ridge in the gap while Geary moved along the western base of the ridge and finally ascended to the crest, reaching it soon after the right of Thomas' assault had occupied it.

As Baird's division reached the crest, it turned northward and became hotly engaged

CHATTEL MORTGAGE — CHATTERTON

with Walthall's brigade, assisted by Jackson's and Moore's, of Cheatham's division. Darkness coming on, the fighting ceased. Walthall's stand across the ridge had made it possible for Cleburne's, Stevenson's, Walker's, and Cheatham's divisions to withdraw in order and unmolested. The centre and left retreated in general confusion, Bate's division, however, soon rallying for a stout resistance as rear guard.

Two myths of the battle have gained general currency. The movements of the Confederate troops which retired from Lookout Mountain and were early sent to confront Sherman gave rise to the report that Bragg was weakening his centre to concentrate against Sherman. But not a single soldier or gun was sent from the centre against Sherman during the day. On the contrary, three brigades, John C. Brown's, George Maney's, and Alfred Cummings', were hurried from Sherman's front to resist the assault of Gen. Thomas at the centre.

The second long perpetuated error is that when Gen. Sherman advanced to the unoccupied hills beyond the north end of Missionary Ridge he had carried the ridge to the tunnel as was contemplated in the order of battle. He did not secure any portion of the ridge during the battle, although those troops which were put in fought desperately. Eleven brigades of his force were held as reserves and were not engaged, Gen. Sherman thinking it necessary to guard against an attack upon his left.

Bragg was promptly pursued. His rear guard made a stubborn stand at Ringgold Gap, but his army was first rallied at Dalton, where it remained until the opening of the Atlanta campaign in the spring of 1864.

The losses at Chattanooga, including the three days' battles and the affairs in pursuit to Ringgold, were for Grant: Killed, 703; wounded, 4,722; missing, 349; total, 5,844; for Bragg: Killed 361; wounded, 2,180; missing, 4,146; total, 6,687. Consult 'War of the Rebellion Records,' Vols. XXX. and XXXI., Parts 1 and 2.

H. V. BOYNTON.

Chattel Mortgage, a transfer of personal property as security for a debt in such manner that upon default the chattel becomes the property of the mortgagee.

In the absence of statute no special form is necessary, the terms depending to a great extent on the intention of the parties. Between the parties to a mortgage, a delivery is not necessary, but to be binding on creditor's delivery to the mortgagee or notice to the creditors is necessary. In mortgage, title, and possession passes; in pledge, possession passes, but title remains in the pledgor.

At common law it was necessary for the chattel to be in possession of the mortgagor at the time the mortgage was given, so as to be binding against creditors; but if the mortgagor acquired title after the mortgage had been given, it was good as between the parties, but not as to creditors. In equity a chattel mortgage is considered in the nature of an executory agreement.

Chattels, property movable and immovable, not being freehold. The word chattels is originally the same word with cattle, all property being reckoned in early periods by the number of heads of cattle possessed, or their equivalent. From the fact that cattle were reckoned

by the head, it appears probable that they were called *capitalia* (from the Latin *caput*, the head), which became contracted by syncope into *capitalia*, and then *catalia*, whence the legal term *catalla*, and our "chattels" and "cattle." Hence the word chattels signified originally only movable property, but in course of time came to be applied to all property not held in feudal tenure. Chattels are divided into real and personal. Chattels real are such as belong not to the person immediately, but dependently upon something. Any interest in land or tenements, for example, is a real chattel; so also is a lease, a rent for a term of years, an interest in advowsons, etc. Chattels personal are goods which belong immediately to the person of the owner, and include all movable property. Chattels usually pass to the executor, except such, for instance, as trees, which may not be severed from the freehold, and therefore pass to the heir.

Chatterers, the popular name of certain insessorial birds of the family *Ampelidæ*, genus *Ampelis*, as the Bohemian chatterer or waxwing (*A. garrula*) and the chatterer of Carolina (*A. cedrorum*).

Chat'terton, Thomas, English poet: b. Bristol 20 Nov. 1752; d. there 24 Aug. 1770. At about 10 years of age he acquired a taste for reading, which became, from that period, a kind of ruling passion. His former melancholy gave way to vivacity and vanity, and dreams of glory, fortune, and immortality. His father had accidentally obtained possession of a number of old parchments of the 15th century. Many of these were consumed in the family, but several fell into the hands of Chatterton, who after a few days declared that he had discovered a treasure. He then procured glossaries of the old dialects of the country, and in 1768, when the new bridge at Bristol was completed, he inserted a paper in the Bristol 'Journal,' entitled 'A Description of the Friar's First Passing Over the Old Bridge, Taken from an Ancient Manuscript.' He was then but 16 years old. Upon being questioned as to the manner in which he had obtained it, he finally asserted that he was in the possession of several valuable old manuscripts, taken from an old chest in Redcliffe Church. He had been engaged for a year in the composition of several poems, which he attributed to different ancient writers, particularly to one Rowley. In 1769 he ventured to write to Horace Walpole, who was then engaged upon his 'Anecdotes of Painters,' giving him an account of a number of painters who had flourished in Bristol, which Chatterton pretended to have discovered along with several ancient poems in that city, and received a polite answer. Discontented with his situation, he went to London. The favorable reception which he there met with from the booksellers inspired him with new hopes. He wrote for several journals on the side of the opposition and indulged the hope of effecting a revolution, boasting that he was destined to restore the rights of the nation. Failing to procure the rewards which he had expected, his situation daily became worse. Although extremely temperate, and often voluntarily confining himself to bread and water, he was frequently destitute even of these necessaries. At last, after having been several days without food, he poisoned himself in 1770, when not yet 18 years old. His works were more extensively read as

CHAUCER

the public became acquainted with the history of his misfortunes. The most remarkable are the poems published under the name of Rowley, which he composed at the age of 15 years. They display a vigorous and brilliant imagination, fertility of invention, and often a deep sensibility. Among the poems which he published under his own name his satires deserve the preference. His prose writings are spirited. Prof. Skeat's edition of his poems is one of the best. See biographies by Dix (1837), Wilson (1869), and Masson.

Chaucer, châ'sér, **Geoffrey**, English poet, "the father of English poetry": b. London about 1340, probably rather after than before; d. 1400. The traditional date for his birth, 1328, is disproved by known facts in his life. His father, John Chaucer, a wine-merchant, was known to the court, and therefore was able to obtain for his son a position as page in the household of the Countess of Ulster, daughter-in-law of Edward III.; here we first learn of Geoffrey, in 1357, and here he may have acquired much of his rather extensive though not very methodical education, besides accomplishments and experience. In 1359 he served in the war in France; he was taken prisoner, but was ransomed in 1360 for a sum which indicates powerful and appreciative friends. Throughout his life he frequently received pensions and gifts from the crown and from John of Gaunt. During the next decade, while he was in the twenties, we know little of him, except that during part of the time at least he was at court as Yeoman of the King's Chamber, an office which doubtless required more dignified social as well as humble domestic duties. In or before 1366, probably, he married; his wife Philippa was a Damsel of the Queen's Chamber, and was almost certainly a sister of Katherine de Swynford, who lived in various capacities, finally as wife, in the household of John of Gaunt. This marriage doubtless strengthened the tie which we know existed between the poet and the prince, though there are indications that Chaucer's wedded life was not altogether comfortable. During this time Chaucer must have written more or less poetry on French models; little of it has survived, however. Chaucer was not a precocious poet. From 1370 to 1380 he went on numerous diplomatic missions to the Continent, which he seems to have discharged with tact and judgment. Of these journeys those to Italy are of particular interest. On the first he was absent for six months in 1372 and 1373, with three or four months in Genoa and Florence and perhaps elsewhere; his main business was to arrange for an English port to receive Genoese trade. The numerous attempts which have been made to prove that he may have met Petrarch in Padua are opposed by a great weight of probability and evidence. He certainly learned the Italian language, and must have brought home Italian manuscripts. In 1378 he was in Lombardy for a month or two conducting negotiations with the noted *condottiere* Sir John Hawkwood and with the Lord of Milan. In 1374, between the two journeys, he received the office of Comptroller of the Custom and Subsidy of Wools, Hides and Wool-fells in the Port of London, which kept him closely applied to its duties for

nearly 11 years, except when he was away; so much so that at this time he rented a house built on the city-wall over Aldgate, 10 minutes' walk from the custom-house. In 1382 he received an additional customs office and in 1385 permission to discharge his duties through a deputy. It was probably in consequence of this that he moved into the quiet country, down the river at Greenwich, whence he would come up to town, when occasion required it, by boat with the tide or on horseback. By nature vivid in energy and interest, he lost no time in devoting part of his new leisure to public duties. In 1385 he became Justice of the Peace for Kent, and in 1386 was elected to represent the county in Parliament. Chaucer's intimate attachment to the court party is illustrated by the fact that during the years 1386-9, when Richard II. was deprived of absolute power, Chaucer was in misfortune; in 1386 he lost his custom-house positions, and for a time was clearly in straitened circumstances. In 1387 his wife seems to have died. With the return of the royal party to power in 1389 Chaucer's fortunes revived, and he received the office of Clerk of the King's Works at Westminster and elsewhere. This he held only two years, and from then till his death little is known of his occupations; at times, in spite of pensions and the like, he seems to have been again in hard circumstances, was several times sued for debt, and wrote more than one poetic appeal for aid. In 1399 he rented a house in the garden of Westminster Abbey for a term (oddly) of 53 years or until his death. On 5 June 1400, the records of the payment of his pensions cease, and there is no reason to doubt that he died late in that year, as has always been understood. It was his burial in the south transept of Westminster Abbey, followed two centuries later by that of Spenser, which has made that the "Poets' Corner." To judge from a more or less authentic portrait of him produced under the direction of his disciple Hoccleve, and from his description of himself in the 'Canterbury Tales,' he was short of stature, fair, and late in life rather stout. Everything testifies to his charm of personality and character.

The most convenient and essential thread by which to trace Chaucer's literary development is the growth of his originality. The usual division of his works into French, Italian, and English periods is misleading and contradicts the facts. We may fitly begin with his translation of the 13th century French amorous and satirical allegory 'Le Roman de la Rose,' which he mentions in the 'Legend of Good Women,' and which we know he produced earlier than 1386, probably by many years. The extant incomplete Middle English translation was never attributed to Chaucer until 1532, but there is good reason to believe that of its three fragments the first, consisting of 1705 lines, may be by him; whether his version originally was longer we do not know. It is certain that the French poem influenced him strongly for many years, by its vision-form, its allegory, and its park-like scenery; and longer yet by its tales, its satire, and its pithy sayings. His first important original and first datable poem is the 'Book of the Duchess,' written in 1369 to commiserate John of Gaunt on the death of Blanche,



GEOFFREY CHAUCER.

CHAUCER

his first wife. It is undeniably pretty and fanciful, but it is strongly under the influence of 'Le Roman de la Rose' and other artificial French poetry, is ill-proportioned, and is far from the directness and naturalness of Chaucer's later literary manner. Had he died in 1370 he would be obscure and probably unknown as a poet. Other poems which may date from much the same period, since they show no Italian influence and little originality, are the 'Complaint to Pity,' which shows him as a poetic lover in the artificial French mode, and the 'A. B. C.,' translated from Deguillville, which shows piety toward the Virgin Mary. His prose translation of the 'De Consolatione Philosophiæ' of the late Roman philosopher Boëthius, though usually deemed much later, may date from 1370-2.

Chaucer's three or four months in Italy in 1373 gave him literary breadth, independence, and ideals. Before this, the only literatures with which he shows familiarity are the ancient Latin and the French. But the conditions, traditions, and manner of poetry among the Romans were so different from those of Chaucer's own day and land, and his own temperament was so unlike that of the ancient Latin poetry which he had read, that he could respond to it far less readily than, for example, Dante did. The literary tradition which it was inevitable that he should begin by following was the French. But mediæval French poetry was in general either undignified and extemporaneous in manner, like the romances, or artificial, like the allegory. In Italy, in the works of the three great 'Trecentisti,' especially Dante and Boccaccio, he found literary work which was contemporaneous in its interest but which had assimilated what the Romans had to teach,—Christian and romantic poetry written in a modern language which was more like poetic English than French was, and of a more dignified yet natural character than was usual in French. It was inevitable that for a time he should be greatly under its influence; even though certain French modes and influences abode with him until the end, and though the differences between his two masters tended finally to free him from the domination of both and to leave him independent.

The most important of Chaucer's poems based directly on the Italian is his longest single poem, the 'Troilus and Criseyde.' There seems to be strong reason to deem it also the first, written 1373-7, though it is usually regarded as dating from about 1380-3. This story, of Criseyde's slow acceptance of Troilus' love, and quick transference of hers to Diomed, is a very free translation and expansion of Boccaccio's psychological epic 'Il Filostrato,' to which it must be admitted that much of the merit of Chaucer's poem is due. The traditional story is a mediæval outgrowth on the Troy-saga; Criseyde is ultimately the same person as Homer's Briseis, but her love-story first appears in Benoit de Saint Maur's 12th-century French poem 'Le Roman de Troie.' Less than a third of Chaucer's lines are translated from the Italian, and he has made important changes in the characterization and some in the plot. The poem is too long and its analysis of emotion frequently fine-drawn and stagnant, but it shows humor, much sympathetic penetration, and skill

in dialogue and in situation, and has been called one of the most beautiful long poems in the language.

Chaucer's next important poem was probably the 'House of Fame.' It shows markedly in detail and sometimes in plan the influence of Dante's 'Divina Commedia,' though it should hardly be called an imitation or parody of it. The poet in an allegorical vision is carried by an eagle through interstellar regions to the dwelling of Fame, where he learns of the capriciousness of that goddess. The poem is ill-proportioned, rambling, and sometimes confused and pointless, but in a high degree is free, fanciful, and humorous. Of special interest are the glimpses it allows us of Chaucer's own circumstances and way of life. It is usually assigned to about 1384, but may have been written as early as 1379.

Much the same merits, without some of these faults, make the 'Parliament of Fowls' one of the most attractive of Chaucer's lesser poems. It is almost certainly a complimentary celebration of the betrothal of Richard II. to Anne of Bohemia, and would therefore date from 1381. The noble female eagle represents the future queen; of the three male suitors, the noble tercelet of course is the king, and the other two are two German princelings, for her marriage to whom during her early childhood there had been negotiations, which for literary reasons Chaucer makes contemporaneous. The poem is rich in its imagery, fanciful (though not wholly original) in its plan, realistic in its humor, and melodious in its verse (especially the roundel at the end).

Two other early poems Chaucer later included in the 'Canterbury Tales,' in each case without obliterating traces of their earlier history. The first is the 'Life of Saint Cecelia,' now the 'Second Nun's Tale.' This sweet and sympathetic, but rather crude and unnatural legend of martyrdom was derived from the 13th-century Latin prose 'Legenda Aurea.' The far more important 'Palamon and Arcite,' which took the first place among the 'Canterbury Tales' as that of the Knight, is a condensed adaptation of Boccaccio's epic 'Il Teseide.' It may probably have been written about 1384-6; assuredly not very much earlier. The idea, long current, that it was written early in the form of seven-line stanzas, and was recast in the couplet-form for the 'Canterbury Tales,' is disproved by both probability and evidence. An outgrowth on the Greek story of Thebes, the poem narrates the rivalry of the imprisoned Theban princes for the love of Emily, the sister-in-law of Theseus. It is less intensive and psychological than the 'Troilus,' but is a brilliant romance of picturesque incident, now gay, now pathetic, and (for all its Athenian location) one chief source whence modern romantic writers drew their ideas of mediæval pageantry.

Among Chaucer's minor works, written at various times, mention should be made of several. 'The Complaint of Mars' is probably an allegory on a certain court-scandal. The fragmentary 'Anelida and Arcite,' noteworthy for the great metrical skill shown in the 'Complaint' near the end, represents Chaucer's earlier use of Boccaccio's 'Teseide,' whence the first part is drawn, and may have been written about

CHAUCER

1383-4. The little poem called 'Chaucer's Words unto Adam' upbraids his careless copyist with amiable raillery. The charming 'Former Age' is based on a passage in Boëthius. The prose treatise on the 'Astrolabe,' written in 1391, and based on a Latin version of a treatise by the Arabian Messahala, instructs the writer's little son Lewis in the use of that astronomical instrument. Of ethical and gnostic *balades* the best are 'Truth' and 'Gentilesse.' The two *balades* addressed to 'Scogan' and 'Bukton' are vivacious and satirical; both men were courtier-friends of Chaucer's, and it is curious to learn that the latter of them lost no time in flouting the poet's advice not to marry, and wedded within two or three months of the writing of the poem. The triple roundel 'Merciless Beauty,' which we can hardly doubt is by Chaucer, is no less musical and clever in metrical form than animated and jolly in substance. The 'Complaint to His Purse,' addressed to Henry IV. and therefore dating from 1399-1400, may be the last poem which Chaucer wrote, but certainly shows no failing of spirits or powers. Of other "balades, roundels, virelays" we have Chaucer's own word for it that he wrote many, most of which unhappily have perished. It should be remarked that several works attributed to Chaucer in old editions, such as 'The Flower and the Leaf,' and the 'Mother of God,' are not by him.

'The Legend of Good Women,' the poet's first attempt at the kind of composite poem at which he made his great success in the 'Canterbury Tales,' marks the culmination and transcending of his conventional and French style. It dates probably from 1386-7; there is no reason to connect it with any incidents of 1385, as was formerly done. It consists of a prologue and the "legends" of 10 classical heroines. In the former the poet, after expressing his passionate devotion to the daisy, is upbraided by the God of Love for having written such antifeminine works as the 'Troilus' and the 'Romance of the Rose,' and is instructed by Alcestis, the mythical Greek heroine, who accompanies the god, to make amends by celebrating ladies who have been faithful to false men. The prologue is now known to be based largely on the poems of three 14th-century French writers, but with amazing vigor Chaucer vivifies the conventions which he borrows, and produces a poem full of fresh love of nature, biographical interest, and quaintly pretty pageantry, which has charmed other poets from the 14th century to Keats and Tennyson. The "legends of Cupid's saints" which follow are largely drawn from Ovid; Chaucer wrote them with less sympathy than the prologue and appears to have wearied of their gloom and monotony. It is most probable that Queen Anne is celebrated in the prologue under the double guise of the daisy and of Alcestis. It is extant in two very different versions, of which "B," usually printed second, is now known to be the earlier-written; "A" was probably produced in 1394 or 1395, after the queen's death, and its cooler tone is due to the excision of the probable references to her.

From his sense of confinement in the 'Legend' Chaucer emerged directly, in 1387, into the multifarious freedom of the 'Canterbury

Tales,' the greatest collection of narrative poems in the world's literature. The "frame-story," as it is often called, many subordinate tales fitted into a main narrative, is of Oriental origin, but was familiar in mediæval Europe; Boccaccio's 'Decamerone,' often wrongly assumed to have been Chaucer's model, is only one of several such collections, and it is most unlikely that Chaucer was familiar with it. Nor is there any good reason to suppose that the poem originated in any actual pilgrimage made by the poet. His design is no less original than it is simple. At the Tabard Inn, Southwark, on 16 April, about 30 pilgrims assemble, drawn from every class of middling English society, and the day after set forth on their 60-mile ride, lasting four or (more likely) three days, to the tomb of Saint Thomas à Becket in Canterbury Cathedral, one of the most popular shrines in mediæval Europe. The host of the inn proposes that by way of pastime they shall tell tales on the ride, and that on their return the teller of the best shall be given a supper,—at his own inn, he is careful to stipulate. These pilgrims are described with immortal charm in a 'General Prologue,' which probably dates from 1387 and is Chaucer's greatest work; its combination of humming realism, pungent satire, rich and delicate humor, penetrating knowledge of human nature and of the world, catholic and democratic sympathy, graphic and pithy style, and abundant and essential poetry has never been equaled. Of the pilgrims about a third are connected with the Church, and of them Chaucer has little good to say, except for the Clerk and the humble but upright Parson, the perfection of whose character atones for all of Chaucer's satire on the church. Among the others, the poet writes with a particular fondness of the military class, represented by the Knight and his young son; and with tolerant satire and an unerring eye for typical features, of the professional and mercantile classes.

Chaucer's original plan called for two tales from each pilgrim on the journey to Canterbury and as many on the return, together with an account of their experiences during and after the pilgrimage; of this prodigious design he completed only about a fifth, 24 tales in all, several being incomplete, scattered over the whole journey to Canterbury. Most of the tales are connected with each other by passages, usually called prologues and "links," in which the narrative of the pilgrimage is carried on, and which contain some of the best and liveliest writing in the poem. Several of the characters, such as the Pardoner and the Wife of Bath, reveal their own views and characters with extraordinary frankness; between others there are lively quarrels; tiresome tales are twice broken off by weary auditors; as the party is nearing Canterbury they are joined by a rascally canon who makes a dishonest living by feigning to practise alchemy, and whose servant, after frightening his master away by his indiscreet loquacity, entertains the company with a tale of another such impostor; throughout, commenting and keeping things harmonious and lively, moves the burly, canny figure of Harry Bailey, Host of the Tabard Inn, the self-appointed "personal conductor" of the party.

Of the tales each is in general admirably

CHAUCER

adapted to the person who tells it; the pious tell of religion, the soldiers of chivalry, the vulgar of licentiousness. Most of them fall into well-recognized classes of mediæval narrative poetry. The tales of the Knight, Squire, Wife of Bath, and Franklin are romantic; Chaucer himself, as a character on the pilgrimage, tells the burlesque romance of 'Sir Thopas,' tactfully unwilling to compete seriously among his own creations; the tales of the Miller, Reeve, Cook, Shipman, Sumner, Merchant, Canon's Yeoman, and Manciple are (or are of the nature of) *fabliaux*, more or less drastically realistic and often very coarse comic tales; those of the Man of Law, Monk, Pardoner, Friar, and Clerk are moral tales of various kinds; the tale of the Nun's Priest is a marvellously witty beast-fable; the Physician's is the Latin story of Virginia, ultimately from Livy; the Prioress', of the Christian child killed by the Jews, and the Second Nun's, of Saint Cecelia, are saints' legends; Chaucer's second tale, of Melibeus and his moralizing wife Prudence, is a didactic prose-work; as is the Parson's, on the sacrament of penance and the seven deadly sins, introduced at the end because it seemed fitting to approach the holy city "in some vertuous sentence." Hardly any of the tales are original in their groundwork; originality in plotting was even less regarded as desirable in the Middle Ages than by Shakspeare; and they are of various and remote origins. The tales of the Squire, Merchant, and Pardoner are ultimately Oriental; those of the Manciple (Ovid's tale of the talking crow) and Physician are from the classics; the Clerk's ideal and pathetic story of patient Griselda is from Petrarch's Latin version of the last novel in Boccaccio's 'Decamerone,' just as the Knight's is from the latter's 'Teseide'; the Wife of Bath's, Man of Law's, Clerk's, and perhaps Franklin's are more or less rationalized fairy-stories, perhaps originally Celtic; the Monk's, patterned after Boccaccio's 'De Casibus Virorum Illustrium,' is drawn from the Bible, Roman writers, Boccaccio, and others; most of the *fabliaux* are probably developed from short humorous French poems; for the Canon's Yeoman's no parallel has been found, and it may be based on fact; the Nun's Priest's is based on some branch of the Old French 12th-century animal-epic 'Le Roman de Renart'; the story of Melibeus comes, through the French, from the Latin of the Italian judge Albertano of Brescia; and the Parson's is from some *rifacimento* of works by two theological writers, Raymond of Pennaforte and Peraldus.

Chaucer probably worked on the 'Canterbury Tales' to near the time of his death. The order and dates of the writing of most of them have not been determined, but there is little reason to believe that any except the Knight's and Second Nun's antedated the beginning of the poem as a whole. It is clear that the order in which they are now printed is far from being the order in which they were written; that the work was extended and filled in at various times and in divers manners, and that it was by a continuation of this process of inserting tales and joining them by links that Chaucer intended to complete the poem and make it continuous. In gradually building up the work Chaucer did not cover his tracks, and in several cases a change

of plan is evident, for he was not always a careful polisher and reviser. A study of the 60 or more manuscripts of the poem shows a probability that by supplying the connecting links he had drawn the work together, at the time of his death, into eight volumes or continuous fragments unconnected with each other (not wholly the same as the nine "groups" in modern editions, which do not seem quite to fit the facts), but that even they were by no means put in their final form. Chaucer's intentions as to arrangement can be pretty well discovered by references to times, tales already told, and such places along the road as Rochester, Sittingbourne, and the Blean Forest, but for every group of tales he may not have decided on the position, and the arrangement of modern editions may represent rather what he would have done than what he did do. Some parts of the work were certainly known to the world before the author's death, and others may have been; but it seems very unlikely that the poem as a whole, as we have it, was put forth otherwise than by Chaucer's literary executors. The arrangement of none of the manuscripts can agree with his intention, and there are many other evidences that his death determined, as it were, a fortuitous cross-section of the growing work. The 'Canterbury Tales' therefore remain the most unfinished and fragmentary of great poems.

Chaucer might well be characterized as an intellectual man of the world. Interested, but not absorbed, in things purely of the reason and the soul, he drew his inspiration chiefly from literature and human life. With science and pseudo-science he was rather well acquainted, especially with alchemy and astrology, although, naturally skeptical, he seems to have believed in neither. In philosophy and theology he shows no great interest, except in the question as to the relation between chance, free-will, and fore-ordination. There are indications that he sympathized with some of Wyclif's teachings; but they no more show that he was a thorough Lollard than his occasional flippancy shows that he held "agnostic" views. There are signs that before his death he became even narrowly devout, and throughout he was probably faithful enough to the Church. It was for poetry that he cared rather than for speculation, and in it he was well and widely read. English poetry was too unoriginal and meant for too rude an audience to appeal to him; he probably read it little, and never mentions it except for ridicule. He, like other educated people, almost confined his reading to Latin and French, with the weighty addition, in his case, of Italian. Ignorant of Greek, like all his contemporaries, he derived most of his knowledge of the ancient world from Boëthius, Virgil, Ovid, Statius, and a dozen or so of other Roman writers. Among later Latin writers, he was somewhat familiar with Saint Jerome, Saint Augustine, and other Fathers, and with many ecclesiastical, didactic, satirical, and historical writers of the Middle Ages, most of whom habitually wrote in Latin. Among these works are several by Boccaccio, with whose Italian poems we have noted already Chaucer's intimacy, as with Dante's 'Divina Commedia;' with Petrarch he was less familiar, though he

CHAUCER

knew his sonnets. With French literature he was intimate, especially the allegorical and the lyric; the romances he knew, but their thin extravagance did not greatly appeal to him. In his best days, what he derived from literature was chiefly an ideal of style, his plots, and occasional ornament. What makes his poetry vital and individual,—characterization, vivid episode and situation, descriptive touches of people and things, vivacious and penetrating side-thrusts or *obiter dicta*, humorous and satirical lights and flashes,—he derived from his intense interest in life, and his vast endowments of humor and observation. His most characteristic humor consists in odd juxtapositions of ideas and in the bold, spontaneous minuteness of his naturalness. The pleasurable effect of all is doubled by his spirit of *bonhomie*, tolerance, and charity. The licentious character of some of his tales is due in part to the frankness of the time, in part to his dramatic instinct for the sort of tale which certain characters would be likely to tell, in part to his hearty appreciation of humor wherever found. He was not naturally romantic, but naturalistic, and investigation shows more and more that the faithful and brilliant reflection of contemporary conditions in his works, especially the 'Prologue' of the 'Canterbury Tales,' is quite equal to his nice observation of characteristic acts and habits. The thoroughly romantic and idealistic character of most of the literature and art of the Middle Ages throws Chaucer's individuality into high relief, and gives the modern a peculiar sense of kinship with him.

Chaucer's style carries on the tradition inherited by the later Middle Ages of a poetry orally sung or recited, yet modified by the more dignified manner which he learnt from the Italians. Hence his combination of informality with amenity, which gives him a magically gracious ease. It is this, with his perfect freedom from artifice, with his complete frankness, his instinct for a situation, his readiness to vary his mood, and his knowledge of what to select and (usually) what to omit, that makes him a consummate narrative-poet. Of all English versifiers he is one of the most melodious, provided a reader understands the chief differences between Middle and Modern English,—that the vowels have their Continental sounds, that in general all letters are pronounced (including especially the final *e*), and that many French words are still accented on the last syllable. His chief verse-forms, in order of date and increasing excellence, are the 8-syllable couplet, the 7-line stanza, and the 10-syllable couplet; the two latter he was the first to use in English, having adopted and perfected them from the French.

Chaucer is frequently called "The Father of English Poetry," and the title is perhaps better deserved than such epithets usually are. While he stands at the end of a long evolution in a more real sense than at the beginning of another, the former line was not a native one. His was the dominant literary influence in England and Scotland during the barren century and more after his death, and he, his contemporary and friend John Gower, and his disciple John Lydgate, were repeatedly named as the three glories of English letters. At the end of the 15th cen-

tury, the 'Canterbury Tales' were twice printed by Caxton, and twice by others; in 1532, William Thynne brought out the first fairly complete edition of Chaucer's works. In the 16th century, as well because, owing to rapid changes in the language, his vocabulary seemed archaic and his verse unmelodious, as because the direct influence of Italian and ancient literature came in, his influence decayed. Nevertheless, especially in regard to style, it was strong upon Spenser, who calls him, in celebrated phrase,

"Dan Chaucer, well of English undefyled,
On Fames eternall beadroll worthie to be fyled."

In the 17th and early 18th century there was a tendency not to take him very seriously, but he delighted and sometimes influenced Shakspeare, Milton, Dryden, and Pope. Late in the 18th century, with the development of an interest in the past, in part romantic and in part historical, reviving appreciation of Chaucer was indicated and stimulated by the treatment of him in Warton's 'History of English Poetry' (1774) and by the admirable edition of the 'Canterbury Tales' by Thomas Tyrwhitt (1775-8; several times reprinted). His influence is more or less traceable on Wordsworth, Scott, Keats, Longfellow, Morris, and Tennyson, to mention no others. Within the last 40 years knowledge of Chaucer has been added to and interest in him enlivened by the work of very numerous editors, investigators, and critics, not only in England, America, and Germany, but even France and Italy; notably Child, Furnivall, Skeat, and ten Brink.

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CHAUDIÈRE — CHAUNCEY

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Chaudière, shō-dē-ār, a river of Canada, which has its rise in Maine, near the source of the Kennebec, and flows north for 120 miles and joins the St. Lawrence about six miles above Quebec. Between two and three miles above its mouth it forms the Chaudière Falls. Chaudière Lake is an expansion of the Ottawa River just above the city of Ottawa.

Chauffeur, shō-fēr (Fr. a "stoker"). This term has recently come into use in the English language to designate at first the engineer or motorman of a steam-driven road carriage; but by extension it is now applied to any professional machinist who operates an automobile, electrically or otherwise propelled.

Chauffeurs, shō-fēr, or **Garrotteurs**, gār-ōt-tēr, an organization of brigands during the Reign of Terror in France. Their headquarters were first in the forest of Orgères, near the city of Chartres, and afterward they infested other parts of the country in bands organized under the leadership of Johann Buckler, surnamed Schinderhannes, until 1803, when the measures adopted under the consulate put a stop to their depredations. They garrotted their victims, and tortured and burned (*chauffé*) their feet to make them disgorge their treasures.

Chaulmugra, chāl-mūg'ra (*Gynocardia odorata*), a tree of the order *Bixaceæ*, which grows in eastern countries, and from the seeds of which an oil is obtained that has been long known and highly valued in India and China as a remedy in skin diseases. The oil has been introduced into Great Britain, and is said to be useful in rheumatism, sprains, etc.

Chaumont, shō-môn, France, the capital of the department of Haute Marne, on a height between the Marne and the Suize, 145 miles southeast of Paris by rail. It is well built, has a fine town-hall, court-house, communal college, public library, church dating from the 13th century, the ruins of a castle belonging to the counts of Champagne, and an iron bridge of 50 arches on which the railway crosses the Suize. There are manufactures of gloves, cutlery, leather, woolens, sugar, etc.; and a trade in the iron and iron goods of the department. Here was signed, March 1814, a treaty between Great Britain, Russia, Austria, and Prussia, in which these powers pledged themselves to accomplish the overthrow of Napoleon and restore peace to

Europe. Philip Le Bon, the first who advocated the use of gas for illumination, in France, was a native, and his memory is honored by a bronze statue. Pop. (1901) town 11,697.

Chauncy, chān'sī, **Charles**, Puritan clergyman: b. Yardleybury, Hertfordshire, November 1592; d. 19 Feb. 1672. He was the second president of Harvard College, and the ancestor of all who bear the name of Chauncy (or Chauncey) in the United States. Educated at Westminster and Cambridge, he made the acquaintance of Archbishop Usher, and was appointed professor of Greek at Cambridge. Leaving that position soon after, he took the vicarage of Ware, Hertfordshire. His stern Puritanism involved him in a difficulty with the ecclesiastical judicatories on the publication of the 'Book of Sports,' and the railing out of the communion table. He was imprisoned and fined for his denunciation of these acts of the Church, and recanted, but soon repented of his recantation. He therefore determined to embark for New England, where he arrived a few days before the great earthquake, 1 June 1638. Here he was reordained, and for three years remained in Plymouth as assistant pastor, and then took the pastoral charge of the church in Scituate, Mass. There he remained until the change in the ecclesiastical polity of England, when he resolved to return to his vicarage in Ware, which had invited him home. But the first president of Harvard College, Mr. Dunster, resigning just at that time, the office was offered to Mr. Chauncy and accepted (1654), which station he held until his death. He was not a voluminous writer, and a few theological works and a number of sermons are all that remain of his writings.

Chauncy, **Charles**, American minister, b. Boston, Mass., 1 Jan. 1705; d. there 10 Feb. 1787. He graduated at Harvard College in 1721, and was ordained pastor of the First Church in Boston in 1727. He was a copious writer, and published many works; among the rest, a 'Complete View of the Episcopacy,' being the substance of a discussion with Dr. Chandler, of New Jersey; 'Seasonable Thoughts on the State of Religion in New England'; 'Discourse on Enthusiasm'; 'Remarks on the Bishop of Llandaff's Sermon'; 'Mystery Hid from Ages, or the Salvation of all Men'; 'The Benevolence of the Deity.'

Chauncey, **Isaac**, American commodore: b. Black Rock, Conn., 20 Feb. 1772; d. Washington 27 Jan. 1840. He commenced his career in the merchant service, in which he became distinguished for seamanship, enterprise, and energy. He entered the navy as lieutenant in 1799, and early in 1802 was appointed acting captain of the frigate Chesapeake, the flagship of a squadron ordered to the Mediterranean to operate against Tripoli. In the brilliant operations before Tripoli in 1804 he bore a distinguished part. In April 1806 he was promoted to the rank of captain. In the War of 1812 the naval superiority on the lakes became an object of high importance, and Commodore Chauncey, then in command of the navy yard at New York, was appointed to command on all the lakes except Champlain. He commanded the Mediterranean squadron 1816-18 and at his death was president of the navy commission.

CHAUS — CHAUTAUQUA

Chaus, kā'us, the native name for the East Indian jungle-cat (q.v.).

Chautauqua, sha-tâ'kwä, a popular educational centre on Chautauqua Lake in the southwestern part of New York State. It is an incorporated town, 165 acres in extent, on the upland terraces of the lake, at a high elevation, although lying in a lowland corner of the State. Chautauqua is 70 miles south of Buffalo, 200 miles north of Pittsburg, and 450 miles west from New York. It is reached by the Pennsylvania and Erie railways. Chautauqua has numerous large and commodious school buildings; several thousand cottages in the woods; an hotel called "The Athenæum"; a few shops or "stores"; a plain college building on a hill-top, with a beautiful lake-environment; a so-called "hall of philosophy," which is a wooden temple with supporting pillars, open to the summer breeze, and seating 3,000 people; and a vast amphitheatre, like a Greek theatre dug out of a hillside, but well roofed, well lighted by electricity, and capable of seating 5,000 or 6,000. For nine months of the year it is a town of 1,000, but during the summer, while the classes are being held, has a population ranging from 30,000 to 60,000.

As an educational institution Chautauqua has become a centre of great importance. It may be considered primarily as an unconscious educational adaptation of the open-air public assembly such as the American mass-meeting or town-meeting, or the religious camp-meeting. The Chautauqua Assembly was established by Lewis Miller in 1874 at Fairpoint, for Bible study and the training of Sunday-school teachers. But the ideal and purpose of the assembly were gradually broadened; and to the specifically religious study a great variety of subjects were added. The religious spirit, however, pervades the work of the assembly. The best exponent of the spirit of the institution was its chancellor, Dr. John H. Vincent. He infused into it the idea that all sound learning is sacred, and that the secular life may be pervaded by religion.

The work done at Chautauqua has been thus summarized in one of the New York State bulletins: "For the many there are popular lectures, concerts, entertainments; for a somewhat less number there are philosophical, scientific, and literary lectures in progressive courses; for the comparatively few are provided means for careful study under able and well-known instructors." The work may be further classified as follows: (1) the college of liberal arts, instruction in languages, mathematics, psychology, political economy, science, etc., by well-known men, continued during the winter by correspondence; (2) school of pedagogy; (3) schools of sacred literature; (4) classes in art, music, physical education, etc.; (5) lecture courses, similar to the university extension lectures, without extra fee; (6) public lectures and addresses by those prominent in various departments; (7) recreative entertainments, concerts, recitals, stereopticon exhibitions, etc.

An important part of Chautauqua's influence is made effective through classes and courses for home study; prominent among these being the Chautauqua Literary and Scientific Circle (C. L. S. C.), founded in 1878. The C. L. S. C.

is a well-directed system of home reading in literature and science, carried on in connection with local reading circles, and practically aided by many good suggestions in a monthly magazine called 'The Chautauquan.' The course of reading occupies four years, which are called respectively the Greek year, the Roman, the English, and the American, from the relative prominence given to the history and literature of those four peoples. The text-books on England and the United States, Greece and Rome, and other subjects, social and economic, are prepared by good writers representing American colleges and universities. With the regular courses in history are combined corresponding literary courses and studies in art, religion, and natural science. In the American year, the special subjects are religion, American history, literature, government, diplomacy, social institutions, and physiology.

The entire expense for the required books and the illustrated magazine is about \$5 per annum. The text-books are now written by Chautauqua specialists, and published by the assembly. The course of reading is carried on by Chautauquans at home, but once a week they meet in local circles in neighborhoods and villages all over the country and, under the best local guidance they can find, devote an evening to the discussion of topics suggested by 'The Chautauquan' and other private reading. The number of these local reading circles during the past 20 years has been about 10,000, and the total enrollment of Chautauqua readers has been about 250,000. By far the larger number fail to complete the four years' course, but it is estimated that about a half have done consecutive reading for two years. A "saving remnant" of about 40,000 continue to the end and win a simple certificate. The graduates are also encouraged to form local educational clubs and continue special study.

Next in importance to the C. L. S. C. are the "schools," wherein definite class instruction, begun under competent direction at Chautauqua, is continued by correspondence with the professor or representative of the "school" throughout the year. This combined work done in residence and by correspondence may, in a few rare cases, lead to the degree of bachelor of arts or bachelor of science, conferred, however, only after searching tests. The degree-giving power is vested in the regents of the University of the State of New York, whose academic honors are, by State examinations, better guarded than are those of some academic corporations in America. A great variety of regular and advanced work is offered; including courses in history, science, pedagogy, and theology (for which the degree B.D. is given).

The "Chautauqua idea," of which much has been said and written, is best expressed by Bishop Vincent, who says: "Chautauqua pleads for universal education; for plans of reading and study; for all legitimate enticements and incitements to ambition; for all necessary adaptations as to time and topics; for ideal associations, which shall at once excite the imagination and set the heart aglow. . . . A college is possible in every-day life if one choose to use it; a college in house, shop, street, farm, market, for rich and poor, the curriculum of which runs through all of life, a college which trains men

CHAUTAUQUA LAKE — CHAYOTE

and women everywhere to read and think and talk and do; . . . this is the 'Chautauqua idea.' »

Chautauqua Lake, a beautiful lake situated in Chautauqua County, N. Y. It is 18 miles long and from one to three miles wide, the highest navigable water on the continent, 730 feet higher than Lake Erie and 1,400 feet above the sea-level. Chautauqua was the Indian name for this lake, the shores of which are a natural "divide" between waters which flow northeastward with the St. Lawrence from the Great Lake district and waters which flow southwestward to the Mississippi River and the Gulf of Mexico. On its banks is the village and summer resort of Chautauqua, the centre of a religious and educational movement of large and growing interest. See CHAUTAUQUA.

Chauveau, shō-vō, Pierre Joseph Olivier, Canadian statesman and writer: b. Quebec 30 May 1820; d. there 4 April 1890. Among his contributions to literature were many popular poems, including 'Simple Joys,' 'Donnaconna,' 'Letters to M. de Puibusque,' also 'Tour of H. R. H. Prince of Wales in America' (1861), 'Souvenirs and Legends' (in prose and verse) (1877), and 'François Xavier Garneau, His Life and Works' (1883).

Chauveau-Lagarde, lä gärd, Claude François, klōd frän-swä, French advocate: b. Chartres 1756; d. 1841. He studied law in his native town and began to practice in Paris shortly before the outbreak of the Revolution. He became celebrated for his eloquent defense of those on trial in the Reign of Terror. He was the advocate of Marie Antoinette at her trial and also of Charlotte Corday. Others of his clients were Brissot and Madame Elizabeth of France. His defense of Mirandola saved the latter from the scaffold. In 1814 he was ennobled by the government of the Restoration and two years later he published an account of the trial of Marie Antoinette and Princess Elizabeth.

Chauvenet, shō-vē-nā', William, American astronomer and mathematician: b. Milford, Pa., 24 May 1819; d. St. Paul, Minn., 13 Dec. 1870. He was graduated at Yale in 1839, and became instructor in mathematics at the Philadelphia Naval Asylum in 1841, professor of mathematics and astronomy at the United States Naval Academy in 1845, and professor of astronomy at Washington University, St. Louis, in 1859. In 1862 he became chancellor of the last institution. He wrote 'Spherical and Practical Astronomy,' 'Elementary Geometry,' and similar works.

Chauvinism, shō'vīn-izm, a French word derived from Nicolas Chauvin, a soldier of the French Republic and of the First Empire. His name became a synonym for a passionate admirer of Napoleon, and the word Chauvinism was formed to signify the almost idolatrous respect entertained by many for the First Emperor, and generally any feeling of exaggerated devotion, especially of patriotism. A vaudeville, 'La Coquarde Tricolore,' in which there was a character named Chauvin, with a song that became immensely popular, fixed the word in the French language. The word is now used to express exaggerated patriotism of an aggressive type, jingoism, etc.

Chaux-de-Fonds, shō-dè-fôn, La, Switzerland, a town in the canton of Neuchâtel, and nine miles northwest of the town of Neuchâtel, in a deep valley of the Jura. Chaux-de-Fonds and the neighboring village of Locle are the chief centres of watch-making in Switzerland. Pop. 35,971.

Chaves, Francisco de, frän-thēs'kō . dā shä'vēs, Spanish soldier of the 16th century: d. Lima, Peru, 26 June 1541. He was a trusted companion of Pizarro in the conquest of Peru, but disapproved of the execution of the Inca, Atahualpa. About 1539 he was sent out by Pizarro to settle Conchucas, but within a few months was assassinated at the same time as his leader.

Chaves, Brazil, a small town in the province of Para, on the north coast of the island of Marajo, at the mouth of the Amazon. Pop. 8,500.

Chaves, shä'vēsh, Portugal, the ancient AQUÆ FLAVIÆ, a town of the province of Trás-os-Montes. The fortifications which once defended it are now in ruins. It is situated on the Tamega River, here crossed by a Roman bridge, 12 arches of which remain out of the original 18, and has hot saline springs and baths. It has an interesting church, the burial place of Alfonso I., Duke of Braganza. Linen manufacture is carried on in the town. In 1811, after a violent conflict, Soult obtained possession of the place; and after the defeat of the Cartistas, 18 Sept. 1837, the famous Convention of Chaves was signed here. Pop. 7,500.

Chavica, käv'ī-kā, a genus of plants, of the natural order *Piperaceæ*, including the common long pepper, Java long pepper, and betel-pepper. The plants of this genus are shrubs very closely resembling those of the nearly allied genus *Piper*, and by some included in it. The leaves of the betel-pepper (*C.* or *P. betel*) form one of the ingredients of the masticatory called betel (q.v.).

Chay-root, chā-, or **Choy-root, choi-**, the roots of a small cinchonaceous plant of Hindustan, the *Oldenlandia umbellata*, extensively cultivated on the Coromandel coast. The roots yield a dye which is used as madder.

Chayote, chī-ō'tā, a climbing vine (*Sechium edule* or *Chayota edulis*), belonging to the *Cucurbitaceæ*, or gourd family. The leaves are strongly three-angled or -lobed, with the broadly cordate base also showing two or four sharp corners. They are deeply concave, have a rough surface with whitish veins, and in color are of a deep fresh green. The pistillate flowers are solitary; the much more numerous staminate flowers are borne on special branches. Pollination takes place through the agency of insects. The ovary is always one-celled, with a single ovule. It is mealy-pubescent when young, becoming spiny with maturity in some varieties. The mature fruits are always more or less compressed, as though built over the large flat seed. In general they are pear-shaped, but vary in their proportions. They weigh from eight ounces to a pound each, and fruits weighing three pounds have been reported. In flavor they resemble summer squash or vegetable marrow.

The chayote is produced in large quantities in Porto Rico for domestic consumption, and it

CHAZARS — CHECK

has recently attained popularity in Australia and Algeria, from which latter country many hundreds of tons are annually shipped to Paris and London. It bears shipment well, an eight- or ten-day journey not affecting its condition. It is in common use as a vegetable in Madeira, Mexico, Central America, the West Indies, California, and Louisiana. It was first reported in Europe by Francisco Hernandez, who found the plant in Mexico about 1560, and described the fruit as suggesting the flavor of roasted oysters, sweet potatoes, or chestnuts. It produces tuberous roots which resemble the yam or cassava. In Mexico the young shoots are sometimes boiled and eaten like asparagus. Both the fruit and the vine are used as fodder for cattle and hogs, and the vines are sometimes used for fancy basket-work and the manufacture of women's hats. The flowers yield an abundance of nectar, and are said to be of value to bees. As an ornamental vine the chayote takes high rank, a single vine being reported as covering a fence 6 feet high and 50 feet long in a few months.

The fruit is eaten in a variety of ways,—boiled and seasoned with pepper and salt; par-boiled and fried; stuffed and baked: in puddings, tarts, or fritters, etc.

The name appears to be a form of the Aztec word *chayotl*, meaning "a head bristling with spines" or "a squash covered with thorns." The popular names are in many cases corruptions of the Aztec term, as the Porto Rican *tayote*; but in the West Indies and Australia it is known as *chocho*; in Louisiana as *mirliton*; and as "vegetable pear" in some parts of the British West Indies.

Chazars, *chä'zärz*, or **Khazars**, a people of the Finnic stock known in the 7th century on the shores of the Caspian; in the 9th century their kingdom occupied the southeast part of Russia from the Caspian and the Volga to the Dnieper. Their capital was long at Astrakhan, called by them Balandshar. They were singularly tolerant of all religions, Jewish, Christian, and Moslem; and a large part of the nation formally adopted the Jewish faith from Jews who fled from the persecutions of the Emperor Leo. It is not improbable that the modern Jews of Russia have at least an admixture of Chazar blood. Cyril converted many to Christianity in the 9th century. The power of the Chazars was broken in 965 by Sviatoslav. In the early part of the next century the destruction was completed by the Byzantine emperors and the Russians.

Chazy (*shā-zē*) **Stage**, in American geology, the limestone beds, 725 feet thick, typically developed at Chazy, N. Y. The name was first applied by the New York Geological Survey. The Grenville limestone of the Ottawa region in Canada corresponds to it. The Chazy limestone was laid down around the border of the old Pre-Cambrian land in Canada and New York in older Ordovician time. It succeeds the Calciferous and is succeeded by the Trenton. Though a well-marked division in New York and Canada it is not determined farther west, but the St. Peter's sandstone, which underlies the Trenton limestone in Iowa, Michigan, and Wisconsin, may be of Chazy age. See **ORDOVICIAN**.

Che-Kiang, *chē-kē-äng'*, or **Che-Chiang**, China, a maritime province lying north of

Fu-kian and south of Kiang-se and including the Chusan archipelago; area, 39,150 square miles. The province is of great commercial importance, containing three treaty ports, Ning-Po, Wan-Chau (Wen-Chow), and Hang-Chau (Hang-Chow) all of which are to be connected with Shanghai by a projected railway under British control. The surface is mountainous and traversed by rivers, notably the Tsien-Tang and Ta-Kia, which run down to the Eastern sea. The Grand Canal, which has its gateway in Che-Kiang, affords the only means of internal communication apart from an extensive system of narrow foot roads. Trade in silk and tea is well developed, this province being, with Chiang-Su and Fu-Shien, the first to contain a treaty port, that of Ning-Po, opened in 1844. Beside tea and silk the province produces cotton and sedge for hats and mats. It imports opium, cotton and woolen goods, tin and iron, kerosene oil, indigo and sugar. Coal is found in the north and iron ore in the south.

Che-Kiang is famed for its native system of education. It contains the great religious and literary centre of China, Hang-Chow (not to be confused with Hang-Kow or Han-Kow), where thousands of candidates yearly resort for the public examinations. Hang-Chow is also the capital of the province, which is ruled by a viceroy. Marco Polo visited Che-Kiang in the 14th century, when it contained beautiful temples, now in ruins. The most magnificent architectural feature of the province is the temple of the Queen of Heaven, dating from 1680. Che-Kiang suffered severely during the Tai-ping rebellion in 1861. The Italians in 1900 laid claim to part of Che-Kiang as a sphere of influence, and demanded the privilege of establishing a port on the coast to be called San Mun. There are thousands of native Christians. The last census (1882) gave a population of 11,588,692. The population in 1900 was estimated at 15,000,000. The foreign population is estimated (1900) at 2,750.

Cheap'side (M. E. *chepe*, market) a thoroughfare of London, running east and west through a part of the city that was in former times a large, open common. In the Middle Ages Chepe was the chief seat of the London retail trade.

Cheat. See **BROME GRASS**.

Cheat River, a river rising in the Alleghanies in West Virginia, and after the union of its four forks, flowing north and then northwest to empty into the Monongahela a few miles beyond the boundary line of Pennsylvania. Its length is about 150 miles.

Cheboygan, Mich., city and county-seat of Cheboygan County, on Lake Huron, and on the Michigan Central and the Detroit & M. R.R.'s, at the eastern end of the Straits of Mackinaw. It became a city in 1886 and is governed by a board of 10 aldermen. It is an agricultural centre, a popular summer resort, and manufactures lumber, paper, leather, and furniture. It has nine churches and an excellent public school system. Pop. (1900) 6,489.

Check, or **Cheque**, a draft or bill on a bank, payable on presentation. A check may be drawn payable to the bearer, or to the order of someone named; the first form is transferable

CHECKERBERRY — CHEE-FOO

without endorsement and payable to any one who presents it; the second must be endorsed, that is the person in whose favor it is drawn must write his name on the back of it. Checks are a very important species of mercantile currency wherever there is a well-organized system of banking. The regular use of them for all payments, except of small amount, makes the transfer of funds a mere matter of cross-entries and transferring of balances among bankers, and tends greatly to economize the use of the precious metals as a currency.

Check'erberry. See GAULTHERIA; PARTRIDGE BERRY.

Checkers, Chequers, or Draughts, a game of skill played by two persons with a checkered board divided into 64 squares, which are alternately colored black and white or black and red, and with 24 small disks of wood or bone technically termed "men," 12 being usually colored black, and the others white or red. At the beginning of the game each player places his men on alternate squares (of the color agreed on) of the first three rows of his side of the board, which is so placed between the two players that each one has at his right hand one diagonal line of two squares of the color chosen to play on (the rule being technically known as "double corners at the right hand"). This leaves the two middle rows of the board unoccupied. The privilege of the first move is determined by lot or in any manner agreed upon; after the first game of a series the first move passes alternately.

The first player advances any one man in his foremost row one square diagonally; his opponent likewise moves a man; and so on alternately until one player exposes a man to capture by leaving a vacant space behind him on a diagonal line on which stands next him a man of the opponent. Capture is effected by the leaping of such "enemy" over the man so exposed and occupying the vacant space, on which the man so taken is removed from the board. For failure to seize the opportunity to take a man prisoner, the opponent may compel the capture of the piece, or he may remove the delinquent from the board,—an operation known as "huffing." (Under certain rules of the game, the "huff" carried with it the privilege of the next move. This is not in common use at the present day. The player who first puts out of action all his opponent's men wins the game. Putting out of action may be accomplished either by capture or by so hemming in the opponent's men that they cannot move. If a player succeeds in getting a man across the whole board into the enemy's rear line of squares, it thereby becomes a "king," with the privilege of moving diagonally in either a backward or forward direction. A "king" is usually distinguished or "crowned" by placing a disk of the same color on its top. More than one man can be captured at a time if they stand in such order on the board that the series consists of a man and a vacant square alternately, and this series may be in a straight diagonal, or in any branching diagonal therefrom, provided the progress of the capturing man be never retrograde,—always toward the king line.

Checkers is a very ancient game. A form of it, of great antiquity in China, is known by the appropriate name of "the game of circum-

vention." It was well known by the Egyptians, Greeks, and Romans, and antiquarians have recognized it as one of the games indulged in by the, practically, recently discovered New Zealanders, who for thousands of years must have been cut off from all Asiatic or European influences. The first English publication relating to it was published in 1566, but the most important early book was Wallet's, published in Paris in 1668. The leading authority is Joshua Sturgis, 'Guide to the Game of Draughts.'

For laws, hints, and diagrams of the American game, as well as for references to the Polish and Spanish varieties, see A. Howard Cady, 'Checkers, a Treatise on the Game.'

Cheddar, chĕd dĕr, England, a village in Somerset County, at the foot of the Mendip Hills, 18 miles southwest of Bristol. The dairies in the neighborhood have long been famous for the excellence of their cheese, which is made from the whole milk, and the whey skimmed off, heated, and added to the curd. Pop. about 2,000.

Cheddar Cheese. See CHEESE.

Chedorlaomer, kĕd-ôr-lā-ō'mĕr, a king of Elam, mentioned in the 16th chapter of Genesis as one of the confederates of Tidal, "King of Nations," in the expedition against the king of Sodom and other rebellious tributaries. See ABRAHAM.

Cheduba, chĕ-doo'ba or chĕd'oo-ba, or **Man-aung,** Burma, an island in the Bay of Bengal, about 25 miles off the coast of Aracan, forming a township of Kyauk-pyu district; area, 240 square miles. On the island is a town of the same name. Cheduba is well wooded and fertile, but unhealthy. On the northwest coast inflammable gasses are discharged in some quantity. The principal product is an excellent tobacco. Rice, indigo, pepper, are also produced; and petroleum is found. Pop. 24,000.

Chee-foo, chĕ-foo', or **Chafoo** (properly the name of the European colony of the Chinese town of Yen-Tai), a treaty port on the north side of the peninsula of Shan-tung, at the entrance to the Gulf of Pechili, in which it is the only port that remains open throughout the winter. The foreign quarter is in some sense a colony of Shanghai, and, having the best climate of all the treaty ports, it is much resorted to by convalescents. The Chinese town has fortifications and a signal-station. As a market for foreign manufactured goods, particularly English cotton yarn and American sheetings, Chee-foo is of great importance. The other principal articles of import are sugar, paper, iron, edible seaweed, matches, and opium. The chief exports are silk, straw-braid, bean-cake, beans, and vermicelli. The Chee-foo Convention, which settled several disputed points between China and Great Britain, and extended certain commercial advantages to the latter country, besides throwing open four new treaty ports, was signed 13 Sept. 1876. Since then the "open door" policy of the United States has tended to widen the relations of this port with the rest of the commercial world. In 1899 American merchandise found a market in Chee-foo to the extent of over \$3,000,000. The port was the scene of a naval demonstration in 1900, when British and American warships threatened to bombard the forts if their hostile attitude was

CHEECHA — CHEESE AND CHEESE-MAKING

not abandoned. There were 150 missionaries in the city, whose rescue from peril was thus effected. Pop. about 32,000.

Cheecha, chē'chä. See GECKOS.

Cheer'yble Brothers, two merchants introduced in Charles Dickens' novel 'Nicholas Nickleby.' They are twin brothers of a very genial and liberal disposition and become staunch friends of the hero. It is said that the novelist reproduced in these characters two cotton-spinners of Manchester.

Cheese and Cheese-making. Cheese is the curd of milk, including principally the casein and fat, coagulated, cooked, drained, and pressed into solid form. Nearly all cheese is made from cows' milk, and originally it was a product of the farm. Now by far the greater portion is made in factories especially fitted for the purpose. The standard factory-made American cheese is practically identical with the English Cheddar cheese, and is often so called.

In the manufacture of cheese a milk rich in fat is preferred, the cheese being nearly all fat and casein. By artificial souring of the milk coagulation is produced, so that the whey or watery part may be separated from the curd. The curd is the raw material operated on; the casein is a proteid substance that may be compared to lean meat, and is coagulated by acid. It is that part of the curd that remains when the fat, sugar, and ash are extracted. The first process of manufacture is to heat the milk (preferably sweet milk) to about 84° F. It is then tested with rennet for ripeness. A graduated cup provided with a fine hole in the bottom is filled with milk and a little rennet added. Rennet, in its commercial form, is a preserved extract from the fourth stomach of a calf. Being of a peptic character it tends to coagulate the milk, and if the milk in the cup coagulates in from 17 to 20 seconds it is sufficiently ripe for treatment. Enough rennet is then added to the supply of milk to coagulate the whole in 25 or 30 minutes. The proportions vary with conditions, but about four ounces of rennet extract to 100 gallons of milk is perhaps an average quantity. When the milk is coagulated, the solid portion or curd in the vat is separated from the watery portion, by allowing the latter to drain off. This waste usually become food for pigs. Gang knives are then brought into use, to cut the curd into cubes of a third of an inch or more, the knives being set a little less than half an inch apart and passed through the curd horizontally and perpendicularly. After cutting, the curd is gently agitated to prevent settling. This allows the curd to shrink, and tends to expel a portion of the whey. The stirring may be done with a curd-rake, but factories more commonly employ what is termed an automatic curd-agitator, which is attached to the vat and driven by steam power.

The mass of curd is next heated very slowly to about 92° F. This cooking process may continue several hours, lasting until the operator finds that the curd will string about a quarter to a third of an inch on a hot iron. The whey is then drawn off. The curd is next turned and piled, to rid it of the excess of moisture. When deemed sufficiently solid it is ground and salted. The grinding may be done in one of several kinds of mills, a common form having

two cylinders with teeth rotating toward each other, which operation picks the curd to pieces.

After grinding, the curd—or cheese, as it may now be called,—is dipped and put into hoops to give it form for pressing. Common sizes of hoops are 14½ × 10 and 13½ × 6 inches. An iron bandage or rim is placed about the hoop to give it solidity, and a cloth wrapped about it to keep the cheese together and secure cleanliness. Pressure is then applied, at first lightly, and then increased, the cheese being usually turned over during the operation. The pressure is maintained for 16 to 18 hours, after which the cheese is ready to be cured.

Curing-rooms are built both above and below ground, the latter being preferred as being easier to maintain at a cool temperature. High temperature is very deleterious to cheese, diminishing its value by melting and leaking of fat, while the texture and flavor are also impaired. A temperature below 65° F. should always be maintained in the curing-room, and 40° is better. Ventilation must be provided, and the usual arrangement is an upright draft-pipe, run high enough to catch the wind, and with a vane at the top to turn the mouth of the funnel to the wind. The process called ripening takes place in the curing-room, determining the particular flavor of the cheese. The ripening is caused by bacteria, as is proven by making cheese from sterilized milk, in which case it retains the flavor of new-made cheese for a very long period. Dairy bacteriologists are endeavoring to isolate the different species of cheese bacteria, that they may be cultured, and incorporated with the milk in starting the cheese-making. In this way the maker would be certain of securing a particular flavor for his cheese, whereas now it is a matter largely of chance as to what bacteria predominate.

The method described above is that followed in practically all the factories of the United States and Canada. More than four fifths of the cheese manufactured is of this character. The remainder is farm-made, or made in urban dairies, or else is manufactured by some other process in imitation of some foreign cheese, as the Swiss Gruyère or Emmenthal, Limburger, Neuchâtel, Brie, etc.

The constituents of milk which determine its value for cheese-making are the fat and casein. Milk may contain from three to eight per cent of fat and from two to five per cent of casein, the average proportion being about a pound of fat to two thirds of a pound of casein. Since the cheese yield increases with the fat in the milk, managers of cheese factories have encouraged the production of milk rich in fat, and perhaps this knowledge is largely responsible for the fact that in 1900, in the factories of the United States, 100 pounds of milk made almost 17 per cent more cheese than it did in 1890.

The analysis of cheese is largely a matter of securing a correct average, as a cheese varies in properties at the centre or at the circumference. A wedge is generally taken as a sample, cut from the centre to the rind, or sometimes a plug, taken at one third the distance from the rind to the centre. The usual test of cheese is to find the proportion of fat. For this purpose the Association of Official Agricultural Chemists of the United States Department of Agriculture have adopted the following method:

CHEESE-FLY — CHEETA

For the estimation of fat in cheese about 5 grams should be carefully weighed, and transferred as completely as possible to a test bottle. From 12 to 15 c.c. of hot water are then added and the bottle shaken at intervals, keeping it warm until the cheese has become softened and converted into a creamy emulsion. This may be greatly facilitated by the addition of a few drops of strong ammonia to the contents of the bottle. After the contents of the bottle have become cold the usual amount of acid should be added and the bottle shaken until the lumps of cheese have entirely dissolved. The bottles are then placed in the machine and whirled, the test being completed in the same manner as with milk. To obtain the percentage of fat the reading should be multiplied by 18 and divided by the weight in grams of cheese taken.

Some cheese is colored by the makers, though the best requires no coloring. Saffron and annatto are used for this purpose. Various herbs are also incorporated with the milk at the time of making the curd, to alter the appearance or flavor of the cheese. Common among these are sage leaves, marigold, and parsley.

A small proportion of the cheese used in the United States is imported. From 5,000,000 to 7,000,000 pounds a year of Swiss cheese are brought in, also some from France, Germany, and England. Such cheese is usually named from the locality whence it comes, though sometimes the name becomes distinctive of a special make, as the Roquefort, which is made from the milk of sheep, mainly the Larzac breed; the Kachkaval (Bulgarian), a white cheese made of sheep's milk; the Parmesan (Italian), which is kept three or four years and polished with linseed oil and charcoal till it shines like ebony; the Limburger (German), characterized by its strong odor; and the Brie (French), which is also odoriferous.

In 1900 there were 3,299 cheese factories in the United States, and 571 factories making both butter and cheese. New York and Wisconsin are the greatest cheese-producing States, their aggregate product being over two thirds the total of the whole country. In 1900 the 1,314 cheese factories of New York produced 127,795,195 pounds, and the 1,286 factories of Wisconsin 77,748,680 pounds. Ohio has 320 factories; Pennsylvania, 140; Michigan, 136; Illinois, 123; Iowa, 89; Vermont, 71; Minnesota, 53, while no other State has as many as 40. The total factory product of the whole United States in 1900 was 281,972,324 pounds; to this should be added 16,372,330 pounds made on farms, and 662,164 made in urban dairies, making a total cheese product for the year of 299,006,816 pounds. Valued at 10 cents a pound, which is an average wholesale price, it was worth nearly \$30,000,000.

Previous to 1850 practically all the cheese made in this county was a farm product. During the period from 1850 to 1860 factories were established in New York State at the rate of three or four a year, and from the latter date the growth of the industry in New York was rapid, as follows: 1860, 17 new factories; 1861, 18 more; 1862, 25; 1863, 111; 1864, 210; 1865, 52; 1866, 46. Since that date the growth has been a normal one. A comparison of census figures for 1890 and 1900 affords a fair idea of the development. In 1890 the milk consumed by the factories of the United States amounted to 2,684,550,517 pounds, and in 1900 it was 2,741,898,114, an increase of only 2.1 per cent. The cheese made from this milk, however, showed a gain in quantity of 18.5 per

cent, the product of 1890 being 238,035,065 pounds, against 281,972,324 for 1900. The cost of production increased more than the product, being 30.3 per cent, or \$16,320,590 for 1890, and \$21,258,712 for 1900. The value of the cheese product for the years named showed the greatest increase in percentage, namely, 33.9, the totals being \$19,802,957 for 1890, and \$26,519,829 for 1900.

The average cheese factory product, as shown by the United States census of 1900 is 72,842 pounds, representing about 730,000 pounds of milk, from about 290 cows. The milk from 1,130,000 cows for a little more than half the year supplies the total for the factories of the country.

During the decade from 1890 to 1900 only three States showed an increase in the farm-made cheese product,—Wisconsin, Pennsylvania, and California. The latter State produced 4,249,388 pounds of farm-made cheese in 1900, as against 2,676,543 pounds of factory make.

Cheese is lower in price during the summer months than at other seasons. Following are the wholesale quotations during the year 1901:

MONTH	New York		Cincinnati		Chicago		St. Louis	
	high	low	high	low	high	low	high	low
January.....	11¼	12	11	12	10½	11½	11½	11½
February.....	12	12½	11½	12	11½	11½	11	11½
March.....	12	12½	11½	12	11	11¾	12	12
April.....	11½	12½	11	12	11½	11¾	11	12
May.....	8½	9½	8½	12	10½	11¾	10	11
June.....	9	9¾	8½	9½	9	10½	10	10¾
July.....	9	9½	8½	9½	9½	10¼	10	11¼
August.....	9⅞	9⅞	9	10	10	10¾	11	11½
September.....	9½	10¼	9½	10	10	10¾	10½	11½
October.....	10¼	10¾	9½	10½	10	10¾	10½	11½
November.....	10¼	10¾	10	10½	9¾	10¼	10¾	11¼
December.....	10	11¼	10	10½	10	10¾	10¾	11¼

For further information regarding cheese see the United States Census reports, and reports of the New York State Agricultural Experiment Station and the Wisconsin Agricultural Experiment Station; also the year-books of the Department of Agriculture.

CHAS. H. COCHRANE.

Cheese-fly, a small, black, dipterous insect (*Piophilæ casei*) bred in cheese, of the same family to which the house-fly, blow-fly, etc., belong. It has a very extensible ovipositor, which it can sink to a great depth in the cracks of cheese, and lay its eggs there. The maggot, well known as the cheese-hopper, is furnished with two horny claw-shaped mandibles, which it uses both for digging into the cheese and for moving itself, having no feet. Its leaps are performed by a jerk, first bringing itself into a circular attitude, when it can project itself 20 to 30 times its own length.

Cheese-hopper. See CHEESE-FLY.

Cheese-rennet. See BEDSTRAW.

Cheeta, Cheta, Cheetah, or Hunting-Leopard, a large tropical cat (*Cynælurus jubata*) forming an offshoot of the *Felidæ*. Its length and slenderness of limb give it a fleetness in running short distances, such as is probably attained by no other large mammal. Its claws are short, blunt, and practically non-

CHEEVER — CHELAN LAKE

retractile. It pursues its prey by chase rather than by stealth; and ordinarily exhibits more dog-like than cat-like qualities, among these being great docility. It can, however, stealthily come upon its prey if occasion demands. It is about the length of a leopard, but stands much higher, is rufous or tawny in color, spotted with black, except on the throat. It is commonest in the African jungles, and thence is more sparsely distributed to India. In India it is tamed and trained by the natives as a hunter. It is treated like a falcon, leashed, hooded, and kept blindfolded until the game is in sight, when it is loosed and darts upon the quarry, which it drags down and holds until the huntsman comes. The ancient monuments show that this leopard was employed by the Assyrian and Egyptian sportsmen of remote antiquity; and it is known that in the 14th century the returning Crusaders introduced the cheeta into Europe where it was used for some centuries.

Cheever, Ezekiel, American school teacher: b. London, Eng., 25 Jan. 1614; d. Boston, Mass., 21 Aug. 1708. He received a good classical education and emigrated to America in June 1637, in order to enjoy religious freedom. With Davenport and Eaton he was one of the founders of New Haven, Conn., where he married and taught school in his own house, Michael Wigglesworth being one of his pupils. About 1650 he removed to Ipswich, Mass., where he was the first master of its Free, or Grammar School; in 1661 he went to Charlestown in a similar capacity, and in 1670 was called to Boston as head master of its free school, and remained there the rest of his life. His 'Latin Accidence: an Elementary Grammar of the Latin Language,' was for a century the most popular introductory Latin text-book used in New England, 18 editions having been printed before the Revolution (10th ed. 1767; 20th ed. Salem 1785). He also wrote 'Scripture Prophecies Explained, in Three Short Essays,' an edition of which was printed at Boston 1757. His funeral sermon was preached by his pupil and friend, Cotton Mather.

Cheever, George Barrell, American clergyman: b. Hallowell, Me., 17 April 1807; d. Englewood, N. J., 1 Oct. 1890. He was editor of the New York 'Evangelist' from 1845 to 1846, and at different times connected with the New York 'Observer' and 'Independent.' He was an able and vigorous writer and speaker, and the author of a large number of works in prose and verse. Among his publications are: 'Studies in Poetry' (1830); 'God's Hand in America' (1841); 'Poets of America' (1847); 'Windings of the River of the Water of Life' (1849); 'The Voice of Nature to Her Foster-Child, the Soul of Man' (1852); 'Lectures on the Life, Genius, and Insanity of Cowper' (1856), arguing that Cowper's religious terrors proved him sane instead of insane; and 'God Against Slavery, and the Freedom and Duty of the Pulpit to Rebuke It' (1857). One of his most effective works was 'Deacon Giles' Distillery.'

Cheever, Henry Theodore, American prose writer and clergyman, brother of the preceding: b. Hallowell, Me., 6 Feb. 1814; d. Worcester, Mass., 13 Feb. 1897. His writings were popular, and include: 'The Island World of the Pacific' (1852); 'Short Yarns for Long

Voyages' (1855); and 'Correspondences of Faith and Views of Madame Guyon' (1886).

Chehalis (chē-hā'lis) **River**, Washington, in the southwestern part of the State. It has its rise in Lewis County, flows north-northwest and through Chehalis County, into Gray's Harbor. Its length is 125 miles, and is navigable for light steamers some distance from the mouth.

Cheilognatha, or **Chilognatha**, kī-lōg'na-tha, one of the two orders of *Myriapoda*, including the millipeds and other forms. See MYRIAPODA.

Cheilopoda, or **Chilopoda**, kī-lōp'ō-da, one of the two orders of *Myriapoda*, represented by the centipeds. See MYRIAPODA.

Cheirromancy, or **Chiromancy**, kī'rō-mān-sī. See PALMISTRY.

Cheiromys, kī-rō'mīs. See AYE-AYE.

Cheiroptera, an order of mammals, the bats, closely related to the insectivores, and characterized by the immense extension of the forelimbs so as to form wings, and by other adaptations of the skeleton for an aerial life. The order is divided into two groups: *Mega-chiroptera* and *Microchiroptera*. The former consists wholly of the great fruit-eating bats of the Old World tropics; the latter contains all the remaining families. They are separated principally by dental features. See also BATS.

Cheirotherium, kī-rō-thē'rī-ūm. See LABYRINTHODONTA.

Cheke, chēk, **SIR JOHN**, English scholar: b. Cambridge 16 June 1514; d. London 13 Sept. 1557. He was educated at St. John's College, Cambridge, and made regius professor of Greek. In 1544 he was appointed tutor to the future Edward VI., and appears likewise to have assisted in the education of the Princess Elizabeth. On the accession of Edward he was knighted, became secretary of state in 1553, and was also a privy-councilor. On the king's death he supported Lady Jane Grey, and was committed to the Tower. After a few months, however, he was set at liberty and settled in Strasburg; but his connection with the English Protestant Church there gave offense to the Roman Catholics in England, and his estates were confiscated. He supported himself by teaching Greek, but in 1556, having been induced to visit Brussels, he was arrested by order of Philip II. and sent prisoner to England. Under threat of the stake he recanted, and received the equivalent of his forfeited estates. His chief distinction was the impulse given by him to the study of Greek.

Chel-ab-ku-kil, or **Ab-ku-kil-chel**, an Indian priest of Yucatan who flourished in the 15th century. His name is mentioned in almost every Yucatanic legend, and fragments of history composed by him are found in documents of the missions of Yucatan and Central America.

Chelan (chē'lān) **Lake**, Washington, in the mountains of Okanogan County, 70 miles long, about 3 miles wide, and the largest lake in the Northwest. Its chief inlet is Stehekin or Pierce River, on which, about three miles distant from the lakes, are the famous Rainbow Falls, 300 feet high. The outlet is Columbia River. Chelan, Moore, Stehekin, and Johns, towns on its banks, are summer resorts.



Fig. 1 Slender Lori. 2 Foot of do. 3 Skull of do. 4 Black-fronted Lemur. 5 Skull of Flying Lemur. 6 Aye-Aye. 7 Flying Fox. 8 Skeleton of a Bat. 9 Head of Vampire Bat. 10 Long-eared Bat hanging. 11 The same flying. 12 Common Bat crawling. 13 Skull of Horse-shoe Bat. 14 Skull of common Bat. 15 Hedge-hog. 16 Skull of do. 17 Mole. 18 Skull of do. 19 Common Shrew. 20 Skull of Water Shrew. 21 Elephant Shrew. 22 Skull of Alpine Shrew. 23 Canadian Mole.

CHELARD — CHELONIA

Chelard, shě-lär, **Hippolyte André Jean Baptiste**, French musician and composer: b. Paris 1 Feb. 1789; d. Weimar, Germany, 12 Feb. 1861. After studying in the various musical centres of Europe, he brought out his first comic opera, 'Casa da Vendere,' in Naples in 1815. In 1816 he settled in Paris as a teacher of music and violinist. In 1827 his lyrical opera, 'Macbeth' (with words by Rouget de Lisle) was very successful, and procured for him the place of chapel master to the king of Bavaria. He produced other operas, cantatas, etc.

Chelléan, shěl-lā-än, this name is given by French archæologists to certain leaf-shaped flint implements found near Chelles in the department of Seine-et-Marne, and supposed to be the oldest relics of prehistoric man in Europe. The name is also given to the epoch, early Pleistocene, in which the makers, who were of the Neanderthal, lived. The climate then was warmer and more moist than now, so much so that the hippopotamus and rhinoceros inhabited Europe. It is impossible to say what was the equivalent of the Chelléan epoch in the United States, though, perhaps, it was equivalent to one of the earlier retreats of the continental ice sheet in the glacial period. See GLACIAL PERIOD; MAN; PLEISTOCENE.

Chelles, **Jean de**, zhöñ dè shěl, French architect and sculptor of the 13th century. He is best known for his work on the southern portal of Notre Dame in Paris. This beautiful entrance remains as it was constructed in 1257.

Chelmonski, chěl-mön'skē, **Joseph**, Russian painter: b. Varsovia. He studied in Paris under Gerson, and has made a reputation by his landscapes and figures.

Chelmsford, chēmz'fērd, **Frederic Augustus Thesiger**, 2D BARON, English general: b. 31 May 1827; d. London 9 April 1905. Entering the army in 1844, he served in the Crimea and through the Indian mutiny. As deputy adjutant-general he served in the Abyssinian campaign, was made aide-de-camp to her Majesty, and adjutant-general to the forces in India (1868-76), and in 1877 was appointed commander of the forces and lieutenant-governor of Cape Colony. He restored Kaffraria to tranquillity, and was given the chief command in the Zulu war of 1879. After great difficulties with the transport, and some disasters, such as those of Isandhlwana and Intombi, he gained the decisive victory of Ulundi on 4 July, before the arrival of Sir Garnet Wolseley, who had been sent to supersede him. On his return to England he became lieutenant of the Tower, a post which he held till 1889. He was appointed lieutenant-general in 1882, in 1888 general, and in 1893 was retired.

Chelmsford, England, a municipal borough and capital of the county of Essex, 29 miles northeast of London, situated at the confluence of the Chelmer and Cann. There is a good municipal water supply, and the streets are lighted by electricity. The church of St. Mary is a fine old building of the 14th or 15th century. Among the public buildings are the corn-exchange and the shire-hall containing the courts of assize. There are manufactories of agricultural implements, electric lighting, and wireless telegraphy works; and a considerable trade in corn and malt is carried on. On the banks of

the Chelmer are several large flour-mills. The town gives name to a parliamentary division of the county. The Romans had a station on the site of Chelmsford, and Roman remains have been found in the neighborhood. Pop. (1901) 12,580.

Chelone, kē-lō'nē, in Grecian mythology, a nymph who, having failed to be present at the marriage of Zeus and Hera, and having ridiculed their nuptials, was plunged with her house by Hermes into the river on whose banks she dwelt, changed into a tortoise, and thus condemned for ever to carry her house upon her back.

Chelonia, kē-lō'nī-ā, or **Testudinata**, tēs-tū-dī-nā'tā, an order or sub-class of *Reptilia* (q.v.) containing the turtles and tortoises, and one of the most sharply defined groups of vertebrates. The body is enclosed in a more or less well developed bony box, from which the head, neck, tail, and two pairs of limbs protrude, and into which they may be completely retracted in some tortoises and terrapins. This box is a unique feature among reptiles and is divided into a dorsal shield or carapace composed of numerous dermal bones usually arranged regularly and supported on the ribs and vertebral spines, and a ventral shield or plastron likewise composed of dermal bones, among which are incorporated the clavicles and interclavicle. Both carapace and plastron are usually encased in horny plates, which do not correspond to the bony pieces. Except for the head and neck, which are flexible, the vertebræ are immovably ankylosed with the carapace. The skull is very compact, with a small brain cavity, and exhibits many structural peculiarities, of which two of the most apparent are the complete fixation of the quadrate bone, and the substitution of horny cutting plates for teeth on the margins of the jaws. Both shoulder and pelvic girdles are permanently enclosed within the shell, and the latter is often firmly united to both carapace and plastron. The limbs may be flattened paddles in the sea turtles, or true walking legs with free toes in the other groups. All chelonians have well developed lungs; but some aquatic forms have additional respiratory organs in the form of vascular areas and papillæ in the pharynx and œsophagus. Without any known exceptions, they are oviparous, and, after burying the eggs in the earth, allow them to be hatched by the warmth of the sun. Except in the colder regions turtles are found throughout the world, and are mostly inhabitants of fresh water, though a considerable number are terrestrial and a few marine. Between 200 and 300 living, and a great many extinct species are known, many of the latter belonging to families not represented in the recent fauna. The chelonia are divided into four sub-orders:

1. *Atheca*, in which the carapace is of leathery consistency and is supported by numerous small, irregular, separate bones free from the ribs. There is one family (*Dermatochelydidae*), containing the leather-turtle (q.v.).

2. *Trionychoidea*, with a true carapace composed of dermal bones united to the ribs, but covered by a leathery skin, and lacking the marginal bones; the pelvis is free from the plastron. There is one family (*Trionychidae*), the soft-shelled turtles (q.v.).

CHELSEA — CHEMICAL AFFINITY

3. *Cryptodira*, in which the carapace is covered with horny plates and provided with marginal bones, and the pelvis is free from the plastron. It embraces the following families: *Chelonidæ*, including marine turtles, as the green, loggerhead and tortoise-shell turtles (qq.v.); *Testudinidæ*, land-tortoises and gopher tortoise (qq.v.); *Chelydridæ*, snapping-turtles and alligator-turtles (qq.v.); *Cinosternidæ*, terrapins and box-turtles (qq.v.); and several others confined to the tropics of both hemispheres.

4. *Pleurodira*, in which the carapace is similar to that of the *Cryptodira*, but the pelvis is ankylosed to the plastron, and the neck folds in a horizontal instead of a vertical plane. They are all inhabitants of fresh waters in the tropical parts of both the Old and New Worlds. Representative families are the *Pelomedusidæ*, tartaruga (q.v.) and *Chelydidæ*, matamata (q.v.).

Consult Gadow, 'Amphibia and Reptiles,' and Baur, in a bulletin of the United States National Museum.

Chelsea, chĕl'sĕ, England, a parliamentary borough in Middlesex and western suburb of London, on the north side of the Thames, chiefly distinguished for containing a royal military hospital. A building was originally commenced here by James I. as a theological college, but was never finished. In the reign of Charles II. the erection of the present hospital for sick, maimed, and superannuated soldiers was begun. It was carried on during the reign of King James II., and finished in that of William and Mary by Sir Christopher Wren, in 1692. The whole expense of this structure amounted to £150,000, and the extent of the grounds is now about 66 acres. The pensioners maintained here number about 550, and consist of soldiers maimed or disabled in the military service, or who have served for 21 years. All pensions are granted by the commissioners of Chelsea Hospital, but most of the recipients are known as out-pensioners. Their number amounts to about 80,000. It is from them that the in-pensioners are selected. Not far from the hospital is a royal military asylum for the education and maintenance of the children of soldiers. George Eliot, Dante, Rossetti, and Carlyle were once residents of this borough. Carlyle is known as "the Sage of Chelsea." Pop. (1901) 93,841.

Chelsea, Mass., a city of Suffolk County, separated from East Boston by Chelsea Creek, and from Charlestown by the Mystic River. It is a suburb of Boston, and is connected with it by ferries, electric, and steam railroads; and the Mystic River is crossed here by a bridge 3,000 feet long. Chelsea has a United States Marine Hospital, United States naval powder magazine, Soldiers' Home, Fitz Public Library, and Odd Fellows' and Masonic halls. It has extensive manufactories of rubber goods, foundry and machine-shop products, leather, cordage, brass goods, pottery, iron and steel, etc. In 1900 there were 308 manufacturing establishments, with \$8,211,682 capital and 3,332 hands and an annual output valued at \$10,333,549. It has numerous churches, high and graded public schools, weekly newspapers, two national banks, and an assessed property valuation of over \$23,000,000. Chelsea was settled at Winnisimmet in 1630; was a part of Boston until it was organized as a town in 1738, and was incorporated as a city in 1857. Pop. (1900) 34,072.

Chelsea Hospital. See CHELSEA.

Chelsea Village, now a part of New York. The name is still preserved in Chelsea Square between Ninth and Tenth Avenues and Twentieth and Seventy-first Streets. Clement C. Moore, the author of "Twas the Night Before Christmas," owned here a farm in the early part of the last century. He sold it off in lots, and the place was called Chelsea Village.

Cheltenham, chĕl'tĕn-am, England, a municipal and parliamentary borough, and popular watering-place, in the county of Gloucester, seven miles northeast of the city of Gloucester, on the river Chelt, a short tributary of the Severn, 120 miles from London by rail. It is a city of gardens, protected by hills, and surrounded with beautiful scenery. Cheltenham spas first occasioned the rapid growth of the town, but the baths and springs are less frequented than formerly. The springs were discovered in 1716 by accident, but became famous in 1788 through a visit paid to them by George III. The parish church is a fine old Gothic structure, and the Roman Catholic and Congregational churches are two of the finest in England. The town is an educational centre. There is a college for boys (founded in 1843), with an attendance of 700 scholars; and the ladies' college, with 500 pupils. There are also two training colleges for teachers. Among the other public institutions may be mentioned its libraries, assembly rooms, the college museum, pump-rooms, theatre, and numerous places of fashionable resort. There are hospitals, orphanages, etc. Cheltenham returns one member to Parliament. The town has a large brewery and ironworks. Pop. parliamentary borough (1901) 52,858; municipal borough 49,439.

Chelyuskin, chĕl-yoos'kĭn, Cape (formerly Northeast Cape, and sometimes called Cape Severo), the extreme northern point of Asia, on a peninsula of the same name, which forms the western arm of the eastern half of the Taimyr Peninsula. It is named after a Russian officer who led an expedition thus far in 1742, and here succumbed, with his wife, to the fatigues of the journey; it was not revisited till 1878, when Nordenskjöld, in the Vega, spent 19 and 20 August here. Lat of the west is 77° 36' 37" N., that of the east 77° 41' N.

Chemical Affinity, the force which causes two or more dissimilar substances to combine in definite proportions to form a new substance, whose properties are distinct from those of any of the constituents. The word "affinity" was originally employed in this sense because it was believed that a kind of relationship exists between substances that are capable of combining with one another. No such idea as this is entertained in modern times, and it might even be said that the tendency toward combination is (in general) stronger, in proportion to the dissimilarity, or lack of obvious relationship, between the substances combining. In the time of Aristotle the constituent particles of bodies were conceived to be endowed with qualities somewhat akin to love and hate. After the advent of Galileo, these notions were exchanged for equally erroneous but more mechanical ones, and the ultimate particles were represented, in thought, as provided with hooks and other similar devices, by means of which their com-



Photograph by J. Horace McFarland Co.

CHELONE (TURTLE-HEAD).

CHEMICAL ANALYSIS

binations were conceived to be effected. Later, when the law of universal gravitation was propounded by Newton, the force impelling the atoms toward one another, and holding them in their combinations, was naturally enough pictured as a special form, or manifestation, of gravitative action. This latter view may possibly be true, but if so we must modify our present views with regard to gravitation somewhat, and assume that it follows different laws, when acting at molecular distances, from what it does when acting at distances that are appreciable to the senses. The modern tendency appears to be rather in favor of viewing chemical affinity as an electrical manifestation, though no really defensible, intelligible, and definite form has yet been given to this notion.

It was formerly thought possible to arrange the elements in the order of their chemical affinity, so that each element in the array would expel all those that preceded it from their combinations, and tables of this sort were published nearly two centuries ago (in 1718) by Geoffroy. Later, it was found that no such definite law exists; and Claude Louis Berthollet, in his famous 'Essai de Statique Chimique' (Paris, 1803), pointed out that the combination of substances depends not only upon the affinity that such substances have for each other, but also upon the relative quantities in which they are present. For example, if barium sulphate and potassium carbonate are melted together, the former is always partially converted into carbonate; but in order to effect its total conversion into carbonate, it is necessary that the quantity of carbonate of potassium present shall be at least six or seven times as great as the equation $\text{BaSO}_4 + \text{K}_2\text{CO}_3 = \text{BaCO}_3 + \text{K}_2\text{SO}_4$ would appear to require. In recent times the necessity of taking account of the relative masses of the combining substances has been fully recognized, and a good idea of the important results that have followed may be had from Nernst's 'Theoretical Chemistry from the Standpoint of Avogadro's Rule and Thermodynamics' (translated into English by Prof. C. S. Palmer). Numerical estimates of the "affinity" of various substances have been obtained by many methods, but the results are not always in as good accord with one another as could be wished, and a discussion of the differences would require a volume. For a brief but excellent review of the different methods consult W. C. D. Whetham, 'Solution and Electrolysis.' See DISSOCIATION; EQUILIBRIUM (*Chemical*), and SOLUTION.

Chemical Analysis is the art of determining the constituents of which a given substance is composed. The analysis is "qualitative" if it is made solely for the purpose of discovering what those constituents are. It is "quantitative" if the object is to ascertain the quantity of each that is present. It is hardly necessary to say that in the examination of an unknown substance a qualitative analysis must be made before a quantitative examination is attempted, because the methods that must be employed in quantitative work depend altogether upon the nature of the constituents that are to be determined. An analysis is said to be "ultimate" when its object is merely to discover what elements are present, and in what quantity each occurs. It is said to be "proximate" when it is made for the purpose of learning how these

elements are combined with each other, and what radicals or other proximate constituents are present. General methods are known, which suffice for the ultimate analysis of any compound that may be proposed; but chemical science has not yet been developed sufficiently to formulate equally general methods for proximate analyses. Methods are indeed known for the recognition of certain of the organic radicals, but most of the problems that arise in proximate analyses are of such a nature that special means must be devised to fit each special case.

QUALITATIVE ANALYSIS OF INORGANIC SUBSTANCES.

In the qualitative analysis of inorganic substances, the color that the proposed compound communicates to the flame of a Bunsen burner often affords useful information as to the nature of the compound, and a systematic examination of the substance in the flame of the blowpipe may afford much additional information. (See BLOWPIPE ANALYSIS.) When the substance is partially volatilized in the flame of the Bunsen burner, or by the electric spark from an induction coil, and the light of the flame (or the spark) is examined through the spectroscope, many of the elements can be recognized, even when present in exceedingly small quantities, by the occurrence, in the spectrum, of certain characteristic bright lines, or groups of such lines. (See SPECTROSCOPE.) The usual method employed, however, for the detection of the commoner bases and acids, is known as the "wet process," and consists in bringing the substance into solution, and noting the behavior of this solution when certain reagents are added to it. Even in the analysis of inorganic substances (which are alone considered in the present section) troublesome combinations sometimes occur, and in such cases the reaction that might naturally be expected at a certain stage in the examination may be modified to a considerable extent, or even be suppressed altogether. An adequate account of conditions of this sort cannot be given in the present article, and they are not stated with any degree of completeness in the more elementary manuals on inorganic analysis. Good accounts of the various difficulties of this sort will be found, however, in Douglas and Prescott's 'Qualitative Chemical Analysis,' to which the reader is referred. The existence of difficulties and limitations being recognized, a general scheme for the detection of the commoner metallic elements may be given, which will be found to work satisfactorily in the majority of cases.

The first step in making an analysis in the wet way is to ensure the absence of organic matter, which might seriously interfere with the subsequent reactions. If organic matter be present, it may usually be detected by heating a part of the compound in a closed tube. If it blackens, or gives off a characteristic empyreumatic odor, organic matter is probably present, and it must be destroyed either by the continued application of heat, or (if there appears to be danger of losing any essential part of the inorganic substance by volatilization) by warming it with strong sulphuric acid. The organic matter being destroyed by either of these methods, the next step is to bring the substance into a state of solution. Water, either cold or hot, should first be tried as a solvent. If this does

CHEMICAL ANALYSIS

not suffice, hydrochloric acid or nitric acid may be tried. If these reagents fail to dissolve it, one part (by weight) of the substance may be mixed with five parts of sodium carbonate and five of potassium carbonate, and the whole heated in a porcelain crucible until quiet fusion is attained. (This may take 30 minutes.) The crucible and its contents are then allowed to cool, and are immersed in dilute hydrochloric acid, or (if silver is suspected to be present) in dilute nitric acid. In this way most of the commoner insoluble substances may be brought into a state of solution. For methods that are applicable to substances that resist this mode of treatment, the more advanced treatises on analysis must be consulted. In case a part of the substance to be analyzed dissolves in water or in one of the other solvents, a separate examination of the solution so obtained should be made, the insoluble part being reserved for subsequent treatment, by the method indicated above.

The metals that will be considered in the present article may be divided into seven general groups, according to their behavior when treated with certain reagents that are known as "group reagents." These classes or groups are as follows:

1. Metals forming chlorids that are insoluble in water, and which are precipitated as chlorids upon adding hydrochloric acid to their solutions. (Silver, lead, and mercurous mercury.)

2. Metals that are precipitated from their acid solutions, by sulphuretted hydrogen, in the form of sulphids that are insoluble in ammonium sulphid, $(\text{NH}_4)_2\text{S}$. (Mercury, lead, bismuth, cadmium, copper, and silver.)

3. Metals that are precipitated from their acid solutions, by sulphuretted hydrogen, in the form of sulphids that are soluble in ammonium sulphid. (Arsenic, antimony, and tin.)

4. Metals whose sulphids are insoluble in water, and which are precipitated from neutral solutions, by ammonium sulphid, either as sulphids or as hydrates. (Iron, manganese, cobalt, nickel, and zinc are precipitated as sulphids; aluminum and chromium as hydrates.)

5. Metals which, upon addition of ammonium carbonate, are thrown down in the form of carbonates that are insoluble in ammonium chlorid. (Barium, strontium, and calcium.)

6. Metals which, upon addition of ammonium carbonate, are thrown down in the form of carbonates that are soluble in ammonium chlorid. (This group contains the single metal magnesium.)

7. Metals which remain in solution when treated by any or all of the foregoing reagents, and all of whose important compounds are soluble. (Potassium, sodium, lithium, and ammonium.)

It will be observed that none but the commoner metals are included in the foregoing list. For the relations of the rarer ones, and for their detection, reference may be had to the manual of Douglas and Prescott, referred to above.

The separation of the groups that are defined above may be effected as follows: Hydrochloric acid is added to the solution under examination, drop by drop, until no further precipitation takes place. The white precipitate consists of the chlorids of the metals of

Group 1, and is to be preserved for further examination. The solution is filtered, and a drop or two of hydrochloric acid is added to the clear filtrate, to make sure that this reagent is incapable of inducing further precipitation. Sulphuretted hydrogen gas is then passed through the filtrate until the liquid smells strongly of the gas. If a precipitate is formed, it will consist of the sulphids of the metals of the second and third groups. Silver, however, will not (in general) be present, because it is ordinarily completely precipitated in the first group, and has therefore been already removed by filtration. Lead may not be completely precipitated in the first group, and hence its sulphid may occur in the present precipitate. The mercury in the present precipitate represents mercuric mercury in the original solution. The mixed sulphids of Groups 2 and 3 are removed by filtration, and are washed until the wash water is no longer acid. They are then boiled with ammonium sulphid. This reagent leaves the sulphids of Group 2 undissolved, but dissolves those of Group 3. Filtration then leaves the sulphids of Group 2 on the filter paper; and when the filtrate is acidified by the addition of hydrochloric acid, the sulphids of Group 3 are thrown down again.

The clear filtrate from which Groups 2 and 3 were removed by sulphuretted hydrogen gas is next made slightly alkaline by the addition of ammonia, and heated almost to boiling. Ammonium sulphid is then added, and the whole is kept warm for some time. The sulphids (or hydrates) of Group 4 are thus precipitated, and may be isolated by filtration. The filtrate from this operation is next boiled to expel all the sulphuretted hydrogen, and ammonia and ammonium chlorid are added. The solution is then heated to the boiling point, and treated with a solution of ammonium carbonate, $(\text{NH}_4)_2\text{CO}_3$. This causes the precipitation of the carbonates of Group 5, which are removed by filtration. The filtrate is boiled, and then treated with a solution of sodium phosphate, Na_2HPO_4 , to which one sixth of its volume of ammonia has been added. Magnesium, the metal of the sixth group, is thrown down (if present) in the form of a white crystalline precipitate having the formula $\text{Mg}_2(\text{NH}_4)_2\text{P}_2\text{O}_7$. This is again removed by filtration, and the filtrate will contain, in solution, the metals of Group 7.

The several groups being thus separated, it remains to examine each group by itself, to see how its components may be isolated or otherwise recognized.

Group 1. The chlorids of this group, as obtained in pursuing the general scheme outlined above, may be separated very readily. Thus if the precipitate of mixed chlorids be treated with boiling water, the chlorids of silver and mercury will be unaffected; but the chlorid of lead will dissolve, and may therefore be isolated by filtration. The mixed chlorids of silver and mercury may be separated by treatment with hot ammonia. This reagent dissolves silver chlorid, which is again precipitated in the form of chlorid upon neutralizing its solution with nitric acid. The hot ammonia does not dissolve mercurous chlorid, but transforms it into a black substance that contains mercury, chlorine, nitrogen, and hydrogen, and remains behind upon the filter paper.

CHEMICAL ANALYSIS

Group 2. All the silver present being assumed to be removed in the first group, the mixed sulphids of Group 2 are washed until the wash water ceases to redden blue litmus paper, and are then boiled with a small quantity of nitric acid. Lead, bismuth, cadmium, and copper pass into solution in the form of nitrates, while mercury sulphid remains unchanged, and may be isolated by filtration. The filtrate, containing the mixed nitrates, is evaporated to a small volume, and sulphuric acid is added. This precipitates lead sulphate, which appears as a whitish precipitate, removable by filtration. The filtrate from this last operation may contain the nitrates of bismuth, cadmium, and copper. If it is made alkaline by the addition of ammonia water, any bismuth that it contains will be thrown down in the form of the hydrate. The cadmium and copper nitrates are simultaneously reduced to the form of hydrates, which, however, remain in solution. Upon passing sulphuretted hydrogen through the solution containing them, a precipitate consisting of cadmium sulphid and copper sulphid is thrown down. If this is boiled with dilute sulphuric acid the copper sulphid remains unaffected, while the cadmium sulphid passes into solution. From the solution, sulphid of cadmium may be again thrown down by adding ammonia till the reaction is alkaline, and then passing sulphuretted hydrogen through the solution. If cadmium is present, its sulphid is thrown down as a bright yellow precipitate.

Group 3. When the sulphids of Group 3 have been isolated, some information may be had at once from the color of the precipitate. Thus arsenic sulphid is yellow, antimony sulphid is red, and tin sulphid is black. If only one of these elements is present, it may therefore be detected by the color of its sulphid. If more than one are present, the mixed sulphids are treated with a solution of ammonium carbonate $(\text{NH}_4)_2\text{CO}_3$. The sulphids of antimony and tin are unaffected, but the sulphid of arsenic passes into solution, and after filtration it may be again thrown down by the addition of hydrochloric acid. The mixed sulphids of antimony and tin are transferred to a porcelain dish, and heated with a small quantity of hydrochloric acid, to which a few crystals of chlorate of potash have been added. By this treatment they are reduced to the form of chlorids. The solution containing the mixed chlorids of antimony and tin should then be somewhat diluted, and a piece of platinum foil wrapped in zinc should be added. By the electrolytic action so set up, antimony and tin are thrown down, in the metallic state, upon the platinum foil; and the foil will be blackened in spots, if antimony be present. In any case the foil should be washed and boiled with hydrochloric acid diluted with its own bulk of water. In this way any tin that may be present is brought into the form of the chlorid, which dissolves; the antimony remaining unaffected. The presence of tin chlorid in solution may be readily demonstrated by the addition of a solution of corrosive sublimate. The tin is thereby reduced to the form of a higher chlorid, and a precipitate of Hg_2Cl_2 (calomel) is thrown down. If no tin is present, this precipitate is not formed.

Group 4. The metals of Group 4 are obtained, in the general scheme of separation out-

lined above, in the form of sulphids and hydrates. The precipitate containing them is to be treated in a porcelain dish with cold dilute nitro-hydrochloric acid. The sulphids of nickel and cobalt remain unaffected, and may be removed by filtration, since the other metals pass into solution. The precipitate that is undissolved should be tested in a borax bead before the blowpipe. (See BLOWPIPE ANALYSIS.) Cobalt gives a blue bead, while nickel gives a reddish-brown one. If both metals are present, the color is intermediate between these two. In the reducing flame the reddish-brown color due to nickel changes to a gray, while the blue of the cobalt remains unaltered; hence the reducing flame should be tried, if no decided indication of cobalt is obtained in the oxidizing flame. For other and more exact tests for distinguishing cobalt from nickel, special treatises on qualitative analysis should be consulted; see, for example, the treatise of Douglas and Prescott, and also Eliot and Storer, 'A Compendious Manual of Qualitative Chemical Analysis.' Nickel and cobalt being removed from the metals of Group 4 by the means indicated above, the filtrate containing the remaining members of the group is boiled until all the sulphuretted hydrogen is expelled. A little nitric acid is then added, and the solution is again boiled until the greater part of the acid is driven off, when the remaining solution is diluted with water. The small amount of free acid that is still present is neutralized with sodium carbonate, care being taken that no permanent precipitate is formed. The solution is allowed to cool, barium carbonate is added in the cold, and the whole is allowed to stand for fifteen minutes. The precipitate contains the aluminum, chromium, and iron in the form of hydrates, and also the excess of barium carbonate. The filtrate contains manganese and zinc. The precipitate is removed by filtration, dissolved in dilute hydrochloric acid, gently warmed, and made alkaline by ammonia. By this process the hydrates of aluminum, chromium, and iron are thrown down, free from barium. This precipitate of the hydrates is collected on a filter, dried, transferred to a porcelain dish, and dissolved in concentrated nitric acid. A few crystals of potassium chlorate are then added, and the solution is boiled for several minutes. Upon adding sodium hydrate in excess, the iron is thrown down in the form of hydrate, the aluminum and chromium remaining in solution. The iron being removed by filtration, the filtrate is divided into two portions. One of these portions is made acid with nitric acid, and ammonia is added in excess. Aluminum hydrate is thrown down, if aluminum is present. The other portion of the filtrate is made acid with acetic acid, and lead acetate is added. If chromium is present, a yellow precipitate of chromate of lead, PbCrO_4 , is thrown down. The filtrate from the treatment with barium carbonate, which may contain zinc and magnesium, is heated to boiling, and the barium that it contains is completely precipitated with dilute sulphuric acid. The precipitate of barium sulphate is removed by filtration, and the filtrate is boiled, after addition of sodium hydrate in excess. If manganese is present, it is precipitated in the form of the hydrate, and may be removed by filtration. The filtrate from this operation is

CHEMICAL ANALYSIS

acidified with acetic acid, and treated with sulphuretted hydrogen gas. If zinc is present, it is thrown down in the form of a white precipitate of zinc sulphid, ZnS.

Group 5. The metals of this group (barium, strontium, and calcium) are isolated, in the general scheme, in the form of carbonates. To separate them from one another, the mixed carbonates are dissolved in dilute acetic acid, and a portion of the solution is tested for barium by the addition of potassium chromate, K_2CrO_4 (not the bichromate, $K_2Cr_2O_8$). If barium is present, a straw-yellow precipitate of barium chromate, $BaCrO_4$, is thrown down. If barium is not present, we may proceed at once to the tests for calcium and strontium; but if it is present, it must first be removed from the solution by cautiously adding potassium chromate until no further precipitate is formed, and then filtering. In this case it is necessary to remove the excess of chromate of potassium before testing for calcium and strontium, because these two metals cannot be separated in the presence of that reagent. For this purpose the filtrate containing the strontium and calcium (which must be perfectly free from barium chromate, even though several successive filtrations may be necessary in order to make it so,) is made alkaline by ammonia, and ammonium carbonate is then added until the carbonates of strontium and calcium are all precipitated, the potassium chromate remaining in solution. After filtration and thorough washing, the mixed carbonates of strontium and calcium are dissolved in hot acetic acid, and the solution is boiled. Dilute sulphuric acid is then added; and if the acid is sufficiently dilute, a white precipitate of sulphate of strontium is thrown down, while the sulphate of calcium (which is formed at the same time) remains in solution. After standing for fifteen minutes or more, in order that the precipitation of strontium sulphate may be complete, the solution is filtered, and the clear filtrate is tested for calcium by first adding ammonia until an alkaline reaction is obtained, and then adding a solution of oxalate of ammonia. If calcium is present, a white precipitate of calcium oxalate is obtained.

Group 6. This "group" contains magnesium only. Hence the presence of magnesium will be made apparent at once in the course of the preliminary separation into groups.

Group 7. Potassium, sodium, lithium, and ammonium belong to this class. These metals are characterized by the high solubility of all their important salts. Ammonia, being used in the separation of the groups as a reagent, is sure to be present in the final solution that has been designated as containing the metals of "Group 7." Hence if it is desired to test for that substance, the test should be made upon a specimen of the original solution, before any ammoniacal reagent has been added. The test is very simple, and consists merely in heating some of the proposed solution with milk of lime (calcium hydrate in suspension). All salts of ammonia are decomposed in this way, with the liberation of ammonia gas, which may be recognized by its smell or by its turning moist red litmus paper blue. The general nature of the reaction involved in the liberation of ammonia gas may be illustrated by the case of ammonium sulphate. We have $(NH_4)_2SO_4 + Ca(OH)_2 = CaSO_4 + 2NH_3 + 2H_2O$. Sodium, potassium,

and lithium may be sought for in the final filtrate obtained in the separation of the fundamental groups, since no compounds of those metals have been used as "group reagents." They are best identified by means of the colors that they communicate to the flame of a Bunsen burner. For performing a test of this sort, the filtrate containing these metals should be evaporated to dryness in a porcelain dish, and the residue ignited until any ammoniacal salts present are eliminated by volatilization. The dish is then allowed to cool, and its contents are moistened with a few drops of distilled water. A piece of platinum wire is next thoroughly cleaned, moistened with hydrochloric acid, and held in the Bunsen flame until it ceases to communicate any color. The wire is then dipped into the solution in the dish, and again held in the flame. Potassium salts give a fine blue color, lithium salts a red, and sodium salts an orange yellow. Unless sodium is present in very small amount, its strong, brilliant flame-color is almost certain to obscure the colors due to any other elements present. Chemists therefore make use of colored glasses that are practically opaque to sodium light, using them as screens through which to view the Bunsen flame. The commonest glass of this kind is the "cobalt-blue" glass, which is used for the detection of potassium, since it is quite transparent to the flame-color of that metal.

For methods of examination adapted to the detection of gold, platinum, and other of the less common metals, reference must be made to books on chemical analysis.

The metals that exist in a proposed substance being known, it remains to discover in what chemical combinations they are present. It is usually impossible to learn, by mere qualitative analysis, which of the acid radicals that may be present is combined with any given one of the metals; but it is possible to ascertain that certain kinds of compounds (such as sulphates, chlorids, and the like), are present, and a chemist of experience, who is familiar with the kind of work in hand, can often infer, with considerable probability, how the bases and acids are associated with one another. In the present article it is not possible to discuss this difficult phase of analysis, but a few of the more common tests for the presence of acid radicals may be given.

There is no general scheme for the detection of these radicals, by which they are separated into groups like the metals, and eventually isolated singly. In examining a substance for them, all that can be done is to apply certain tests, largely independent of one another, and best carried out by dividing the original solution into a number of parts, each of which is to be examined for a single class of acid radicals, and then thrown away.

When a solution of barium chlorid is added to a neutral or slightly alkaline solution, a precipitate of the corresponding barium compounds is thrown down if the solution tested contains sulphates, phosphates, borates, oxalates, fluorides, carbonates, silicates, tartrates, sulphites, hyposulphites, arseniates, arsenites, or chromates. (If the original solution contains lead, silver, or mercury, nitrate of barium is used as a reagent in the place of the chlorid, because otherwise a precipitate of the chlorids of those metals would also be obtained.) The mixed pre-

CHEMICAL ANALYSIS

precipitate just obtained is isolated by filtration, washed, and treated with dilute hydrochloric acid. All of the compounds named pass into solution, with the single exception of the sulphate; and if a white, insoluble precipitate remains after treatment with dilute hydrochloric acid, the presence of sulphates in the original solution is demonstrated. The hydrochloric acid solution is next made alkaline by ammonia, when a precipitate will again be thrown down, if the original solution contained oxalates or phosphates. Certain other salts also may be thrown down at this point; and, therefore, if any precipitate is obtained, confirmatory tests for oxalic and phosphoric acids should be applied to the original solution before the presence of those substances can be regarded as really proved.

If the original solution contains a carbonate, it will effervesce upon the addition of hydrochloric acid, owing to the liberation of carbon dioxide. If it contains a sulphite, the addition of hydrochloric acid will liberate sulphur dioxide, which is readily recognized by smell. If it contains a hyposulphite, sulphur dioxide will also be liberated, but the solution will at the same time become turbid from the liberation of free sulphur. If it contains an alkaline silicate (other silicates are not soluble in water) in considerable quantity, the addition of hydrochloric acid will cause the silicic acid to separate in the form of a gelatinous precipitate, which, when dried and ignited, is gritty. The presence of the arsenic acids may be established by Marsh's test for arsenic. (See ARSENIC.) If a tartrate is present, the original compound, when obtained in the solid state by evaporation or otherwise, is blackened by heat, with a characteristic odor suggestive of burnt sugar. The presence of a fluoride in the original substance is established by the liberation of hydrofluoric acid (see FLUORIN) when that substance is heated gently with concentrated sulphuric acid. The presence of a chromate is indicated by the precipitate from the addition of barium chlorid exhibiting a yellow color. As a confirmatory test, a solution of lead acetate may be added to a neutralized sample of the liquid under examination. If a chromate is present, a yellow precipitate of chromate of lead is thrown down, which is soluble in caustic soda, but insoluble in acetic acid. To test for the presence of borates, a sample of the original liquid is acidified with hydrochloric acid, and a piece of turmeric paper is wetted with it, thoroughly dried before a flame, and finally moistened with a solution of sodium carbonate. If a borate is present, the color of the paper, when wetted with the sodium carbonate, changes to a greenish black.

To test for chlorids and certain other salts, a fresh specimen of the original solution should be chosen, and if it is not already acid, it should be made so with nitric acid. A solution of nitrate of silver is then added, whereupon a precipitate will be thrown down if chlorids, bromides, iodides, cyanides, or sulphids are present. (Cyanid of mercury, however, gives no precipitate at this point.) The precipitate should be removed by filtration, thoroughly washed, and then treated with hot ammonia. The chlorid, bromide, and cyanide of silver dissolve, while the sulphid and iodide remain behind, unchanged. The sulphid is black, while the iodide

is yellowish. For methods of distinguishing between the chlorid, bromide, and cyanide precipitates, reference must be made to the works on chemical analysis. It may be said, however, that the cyanide, when heated is reduced to metallic silver, with the liberation of cyanogen gas. The presence of an iodide, when this is made doubtful by the black precipitate due to a sulphid, may be further investigated by the iodide of starch test. (See IODINE.)

Nearly all of the nitrates and acetates are soluble, and hence precipitation tests are not commonly used for the detection of nitric and acetic acids. Color tests are usually employed instead. To test for acetic acid, the original solution may be made neutral, and a few drops of ferric chlorid added. If acetates are present, the solution takes on a dark red color, owing to the formation of ferric acetate. To test for nitrates, a portion of the original solution is mixed with a solution of ferrous sulphate in a test tube, and strong sulphuric acid is poured down the side of the inclined tube, in such a manner as not to mix with the contents, but to form a layer at the bottom of the tube. If nitrates are present, a purplish or reddish ring, changing to a dark brown, will be observed at the surface of separation of the two liquids.

QUANTITATIVE ANALYSIS OF INORGANIC SUBSTANCES.

Quantitative analysis is far more difficult than mere qualitative analysis, and cannot be treated adequately in a popular encyclopædia. As has been said, unless the nature of the substance is known in some other manner, a preliminary qualitative analysis must be made. Several usual methods of making quantitative analyses will be described below.

Electrolytic Method.—When the substance to be analyzed is an alloy, or a simple mixture of metallic salts, its metallic components may often be readily separated by the electrolysis of its solution, the separation of the metals being based upon the known fact that in electrolysis the nature of the deposit depends largely upon the nature and degree of concentration of the solution, the sizes of the electrodes, and the strength of the electric current that is employed. By systematic study of the effect of these conditions in the electrolysis of mixtures of metallic salts, it is found to be possible to deposit one metal upon the cathode, while the others remain in solution. The electrolytic method has been developed to a considerable extent, and promises to be of great value. Thus far, however, it is not in extensive general use. For details concerning it, consult Classen, 'Quantitative Analysis by Electrolysis,' and the various papers that have been published by Prof. Edgar F. Smith, for some years past, in the Journal of the Franklin Institute. See also the article ELECTROLYSIS in this encyclopædia.

Gravimetric Methods.—Strictly, any method of analysis in which the quantity of each constituent is determined by weighing is a gravimetric method; but the term is usually understood to exclude the electrolytic method just mentioned. In gravimetric work the components that are to be weighed may be separated by fire-methods, or by selective precipitation from solutions, as in the scheme of qualitative analysis outlined above. The fire-methods are commonly used in the estimation of gold and silver,

CHEMICAL ANALYSIS

and are described in the article ASSAYING. The wet methods do not differ in general theory from the method given above for qualitative analysis; for it is evident that any precipitate which contains only one base may be isolated and weighed, and that the quantity of the base present may be calculated from the observed weight of the precipitate, and its known chemical formula. But the practical case is by no means as simple as this statement would indicate; for certain matters of detail, that are not of the slightest importance in qualitative work, must be attended to with great care in quantitative analysis. For example, the substance that is to be determined must be isolated by a method that will ensure its perfect separation from every other substance that may be present; the precipitate that is to be weighed must be granular enough to be filtered easily and without loss; the precipitate must not be liable to oxidation nor other change upon exposure to air for such time as its manipulation may demand; it must be of such nature that it can be thoroughly dried; and it must not be hygroscopic enough to absorb sensible quantities of water from the air, from the time it is dried until the weighing has been completed. Thus in qualitative analysis aluminum may be recognized by the precipitation of the hydrate; but in quantitative analysis it is necessary to reduce the metal to the form of the oxid. The hydrate is usually gelatinous when freshly precipitated, and it retains traces of the acid with which the metal was previously combined, and also traces of the alkali that was used in the precipitation of the hydrate. These facts are of no consequence in qualitative work, but their importance in quantitative investigation is evident.

Volumetric Methods.—In volumetric analysis the quantities that are to be measured are determined by the measurement of volumes, and weighings are resorted to only in the preparation of the standard reagents that are to be used. The reagents are made up in certain standard strengths, according to the purposes for which they are wanted; but the usual strengths are those designated as “normal” and “decinormal” solutions. A “normal” solution is one having such a strength that one litre of the solution contains as many grams of the reagent as there are units in the reagent’s chemical equivalent. Thus the chemical equivalent of sodium hydrate, NaOH, is (in round numbers) $23 + 16 + 1 = 40$; and hence a “normal” solution of sodium hydrate is one which contains 40 grams of that substance to the litre. A “decinormal” solution of this reagent contains 4 grams of it per litre, and a “centinormal” solution contains 0.4 gram per litre. If the reagent is a bivalent acid, or a salt of a bivalent base, the number of grams of it present in each litre of solution must be equal to half the molecular weight. Thus sulphuric acid, H_2SO_4 , contains two atoms of replaceable hydrogen, and its molecular weight is $2 + 32 + 64 = 98$. Hence a normal solution of sulphuric acid contains 49 grams of the anhydrous acid, per litre of solution. The general idea is to have all of the reagents of such a strength that if one cubic centimeter of any “normal” acid solution be added to one cubic centimeter of any “normal” alkaline solution, the mixture will be precisely neutral. As an illustration of the method that is followed, let it be assumed that a manufac-

turer buys a carboy of oil of vitriol, and wishes to know what proportion of pure sulphuric acid it contains. If the acid were quite free from water, 49 grams of it would be exactly neutralized by 1,000 cubic centimeters (that is, one litre) of any normal alkali solution. It is more convenient to work with one tenth of this quantity of acid and reagent; so that the experiment will consist in weighing out 4.9 grams of the oil of vitriol, diluting it with water, adding a piece of litmus paper, and letting a normal alkali solution pass into it (preferably from a graduated burette) until the acid is precisely neutralized. If 100 cubic centimeters of the alkali were required to effect the neutralization, the given sample of oil of vitriol would be known to contain 100 per cent of its weight of sulphuric acid,—or to be entirely free from water. On the other hand, if only 53.9 cubic centimeters of the normal alkali solution were required to effect neutralization, the sample would be known to contain 53.9 per cent of its own weight of sulphuric acid. As a further example, suppose it is desired to ascertain the percentage of sodium oxid present in a given sample of crude soda ash, without raising the question as to whether the sodium actually occurs as oxid, hydrate, or carbonate. The formula of sodium oxid is Na_2O , and its molecular weight is $46 + 16 = 62$. As it contains two atoms of sodium to the molecule, we weigh out 3.1 grams (not 6.2 grams) of it, dissolve in water, and dilute and add litmus paper as before. Then into the solution we pass a normal acid solution until neutralization is effected. If 46.7 cubic centimeters of the normal acid solution are required, the alkali present in the sample, when computed as sodium oxid, constitutes 46.7 per cent of the weight of the whole. This process is called “acidimetry” when it is used for estimating the strengths of acids, and “alkalimetry” when it is used in estimating the strengths of alkalis. As a further illustration of volumetric methods the estimation of chlorine (known as “chlorimetry”) may be considered. If the substance to be examined for chlorine is bleaching powder, 10 grams of the powder are dissolved by rubbing with water in a mortar, and the solution is diluted till it occupies a litre. It is then well shaken, and 100 cubic centimeters are drawn off into a beaker, by means of a pipette, and treated with a decinormal solution of arsenious acid (As_2O_3) until a drop of the mixture, when withdrawn by a glass rod, gives no blue stain upon filter paper that has been soaked in starch liquor and iodide of potassium. The number of cubic centimeters of decinormal arsenious acid solution required is to be multiplied by the constant multiplier 0.00355, and the product is the weight of available chlorine, in grams, contained in each gram of the original powder. (For explanation of the multiplier 0.00355, and for full details of this process and of volumetric analysis generally, consult Francis Sutton, ‘Systematic Handbook of Volumetric Analysis.’)

The analysis of gases is of so special a character that it is treated under a separate heading. See GASOMETRIC ANALYSIS.

ORGANIC ANALYSIS.

In the analysis of organic compounds, no general scheme can be given, corresponding to

CHEMICAL CRYSTALLOGRAPHY

that which is used in the systematic examination of inorganic substances. The number of possible organic compounds is so great, that practically nothing can be done in the way of effecting a "proximate" analysis of a compound concerning whose general nature we have no preliminary information. For the more or less general methods that have been developed for the examination of special classes of organic substances, advanced books on organic analysis must be consulted. The ultimate analysis of an organic substance consisting of oxygen, hydrogen, and carbon, may be effected by burning the substance in a glass tube in a current of oxygen gas. The carbon is converted into carbon dioxide, which is absorbed by potash and estimated quantitatively by observing the gain in weight of the potash; and the hydrogen is converted into water, which is similarly estimated by absorption by calcium chloride. The oxygen of the original compound is then estimated by difference. When nitrogen is also present, the process is somewhat more complicated. In this case the gases of combustion may be passed over red-hot metallic copper to absorb the oxygen, and the nitrogen may be measured in the free state, the oxygen being finally concluded by difference, as before.

Consult (in addition to the works mentioned above), Fresenius, 'Manual of Qualitative Chemical Analysis' and 'System of Instruction in Quantitative Chemical Analysis'; Thorpe, 'Quantitative Chemical Analysis'; Prescott, 'Outlines of Proximate Organic Analysis.'

A. D. RISTEEN, PH.D.,

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Chemical Crystallography is concerned with the relations between crystal form and chemical composition. It may be conveniently divided into three topics; polymorphism, isomorphism, and morphotropism.

Polymorphism.—Some substances crystallize in two or more distinct modifications of different crystal systems and with different physical properties. This phenomenon of same composition and different crystal form is known as *polymorphism*. Thus sulphur on separating from a solution in carbon bisulphide crystallizes in rhombic bipyramids while from a molten state it separates in monoclinic needles. Among other examples of polymorphism are: Carbon; isometric as diamond, hexagonal as graphite; Hg I₂, tetragonal (red), orthorhombic (yellow); ZnS, isometric as sphalerite, hexagonal as wurtzite, Fe S₂, isometric as pyrite, orthorhombic as marcasite; CaCO₃, trigonal as calcite, orthorhombic as aragonite. Corresponding to differences in the crystal form there are also differences in physical properties. A prominent example is diamond, with specific gravity 3.5 and hardness 10; graphite with specific gravity 2 and hardness 1.

Isomorphism.—Many substances of similar chemical composition crystallize in forms that are closely related in angles. Thus CaCO₃, MgCO₃, Fe CO₃, MnCO₃, and ZnCO₃ (calcite group), all crystallize in the trigonal system with (1011 0111) from 72° 30' to 74° 55'. Such compounds are known as *isomorphous compounds* and are in general salts of the same acid with different metallic elements. The discovery of isomorphism is due to Mitscherlich, who in a

purely chemical investigation in 1819 observed that the phosphates and arsenates of potassium and ammonium possess the same crystal form. The most careful series of measurements of isomorphous substances is that made by Tutton on the monoclinic double sulphates of K, Rb, and Cs with Mg, Zn, Fe, Ni, Co and Cu. Taking the Mg salts as an example we have the following axial elements:

K ₂ SO ₄ .MgSO ₄ .6H ₂ O	0.7413:1:0.4993;	β = 75° 12'
Rb ₂ SO ₄ .MgSO ₄ .6H ₂ O	0.7400:1:0.4975;	β = 74 1
Cs ₂ SO ₄ .MgSO ₄ .6H ₂ O	0.7279:1:0.4946;	β = 72 54

Thus it is seen that the geometrical properties of the Rb salt are intermediate between those of the K and Cs salts just as the atomic weight of Rb(85) is intermediate between those of K(39) and Cs (133). And the same is true of the other series taking Zn, Fe, etc., instead of Mg. Among minerals there are a number of prominent isomorphous groups.

Pyrite group—isometric diploidal class—pyrite, Fe S₂, cobaltite, CoAsS, gersdorffite, NiAsS, smaltite, CoAs₂, sperrylite, PtAs₂. **Ruby silver group**—ditrigonal scalenohedral class—pyrargyrite, Ag₃SbS₃ (c = 0.7897) and proustite, Ag₃AsS₃ (c = 0.8038). **Rutile group**—tetragonal—TiO₂, SnO₂, PbO₂, and MnO₂. **Spinel group**—isometric—MgAl₂O₄, FeAl₂O₄, ZnAl₂O₄, FeFe₂O₄, MgFe₂O₄, MnFe₂O₄. **Aragonite group**—orthorhombic—CaCO₃, BaCO₃, SrCO₃, PbCO₃. **Barite group**—orthorhombic—BaSO₄, SrSO₄, PbSO₄, CaSO₄. There are also close resemblances in the physical properties of isomorphous substances. Thus the calcite group of carbonates all have rhombohedral cleavage and hardness 3 to 4.

Isomorphous Mixtures.—Isomorphous substances cannot be separated by crystallization, as they crystallize together, forming mixed crystals or isomorphous mixtures. Isomorphous mixtures are very common among minerals. Thus in the calcite group besides the simple carbonates we have (CaMg)CO₃, (MgFe)CO₃, (CaMgFe)CO₃, etc. In silicate minerals isomorphous mixtures are the rule. Thus the pyroxenes are isomorphous mixtures of Ca, Mg, and Fe silicates principally. Olivine is an isomorphous mixture of Mg₂SiO₄ and Fe₂SiO₄. The geometrical and physical properties of isomorphous mixtures usually vary continuously with the composition. This is illustrated in the following tabulation of MgSO₄.7H₂O and ZnSO₄.7H₂O:

Percent. Mg. salt.	Spec. Grav.	110:110	Optic Axial Angle
100	1.67	89° 25'	78° 18'
78	1.73	89 18	76 56
36	1.86	89 1	74 9
0	1.96	88 48	70 53

Morphotropism.—This is the term applied by Groth to alteration in crystal form brought about by substitution of certain atoms or groups of atoms for others and it has been of particular value in organic chemistry. The crystal system may or may not be affected by the substitution. The derivatives of benzene C₆H₆ have been most completely investigated. The tabulation shows the changes brought about by the substitution of certain groups. Only one axis suffers any appreciable change. All of these are orthorhombic.

CHEMICAL INDUSTRY

C_6H_6	0.891:1:0.799	$C_6H_2(OH)NO_2$	0.937:1:0.974
$C_6H_4(OH)_2$	0.910:1:0.540	$C_6H_4(NO_2)_2$	0.943:1:0.538
$C_6H_3(OH)(NO_2)_2$	0.933:1:0.753	$C_6H_3(NO_2)_3$	0.954:1:0.733

The following shows that identity of crystal system is not essential in morphotropic substances.

$2N(CH_3)_4Cl.PtCl_4$	Isometric	III — III	= 70°	32'
$2N(CH_3)_3C_2H_5Cl.PtCl_4$	Isometric	III — III	= 70	32
$2N(CH_3)_2(C_2H_5)_2Cl.PtCl_4$	Tetragonal	III — III	= 72	43
$2NCH_3(C_2H_5)_3Cl.PtCl_4$	Tetragonal	III — III	= 70	49
$2N(C_2H_5)_4Cl.PtCl_4$	Monoclinic	III — III	= 69	19

The humite group is a prominent example of morphotropism among minerals.

Chohdrodite.....	Mg ₃ [Mg(F.OH)] ₂ (SiO ₄) ₂			
Monoclinic		1.086:1:3.144		
Humite.....	Mg ₅ [Mg(F.OH)] ₂ (SiO ₄) ₃			
Orthorhombic		1.080:1:4.403		
Clinohumite.....	Mg ₇ [Mg(F.OH)] ₂ (SiO ₄) ₄			
Monoclinic		1.080:1:5.658		

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Chemical Industry, The. According to the statistics published in the last report of the United States Census Bureau the American chemical industry ranks as the fourth largest manufacturing interest in the country. Out-ranked only by such industries as those of iron and steel, woolen goods, and cotton manufactures — for it must be remembered that cattle killing, the making of boots and shoes and of clothing, as well as several other "assembling" industries, are not accounted as manufactures proper by the census statisticians — it also represents a wider diversity of interests than any other of the great industries which combine to represent the source of revenue that has made the United States the most prosperous of nations.

At the same time, it is somewhat remarkable to recall what a brief period of existence this industry has had in the United States. Great as the proportions are to which it has attained to-day, not one of its products are known to have been made in America prior to about 100 years ago. To-day there is scarcely a State in the Union that cannot boast of prosperous chemical establishments, and yet, less than a century ago, there was not one such factory anywhere in the country.

According to the best reports that are obtainable, the first attempt to manufacture chemicals in any considerable quantity was made in 1810, when 8,000 pounds of copperas were produced in Vermont, and a lesser amount in Maryland. Three years later an equally successful attempt was made to manufacture alum in Maryland, and, in 1816, a Baltimore house began to make chemicals, paints, and medicines for the general trade. It is true that some oil of vitriol had been made in Philadelphia as early as 1793, but the quantity was so small as to be scarcely worthy of notice except as a historical fact. According to the census reports of 1820, there were but two chemical manufactories in the entire State of New York.

In spite of this small beginning the chemical industry spread so rapidly that, by 1830, it had become a trade of considerable importance to the country. Prior to about 1815 everything

needed in this line had been imported from Europe and as this necessitated the addition of transportation and other charges to the original cost, the American manufacturers who had need of such products in their factories and shops were very glad to learn that such materials might be produced in their own land. For economy's sake, if for no other reason, therefore, they were ready to patronize any local firm that would undertake to make the chemicals they required, so, in 1830, the census reports told a different story.

Whereas, in 1820, the chemical industry had been worthy of slight notice, 10 years later it had been extended to such a degree that the 30 firms then engaged in the business represented an invested capital of \$1,158,000, and an annual product of fully \$1,000,000. Alum, copperas, and several other articles, were then so largely manufactured in America that the foreign product had been almost entirely excluded from this market. And in addition, the list of American productions then included calomel and a number of other mercurial preparations, Rochelle and Glauber's salts, ammonia, oil of vitriol, sulphate of quinine, tartar emetic, aqua fortis, Prussian blue, chrome yellow, chrome green, refined saltpetre, borax and camphor, acetate and nitrate of lead, prussiate and bichromate of potash, and tartaric, nitric, muriatic, oxalic, and acetic acids.

Great as this advancement was, however, those who compare this first report of a practically infant industry with the census figures that were gathered in 1900, will have a striking illustration of the manner in which these great manufacturing interests have extended their operations during the past three-quarters of a century. The total figures for 1900 are shown in the following summary:

CHEMICAL INDUSTRY IN 1900.

Number of establishments reporting.....	1,740
<i>Capital:</i>	
Direct Investment.....	\$238,529,641
<i>Officers, firm members, and clerks:</i>	
Total number.....	8,605
Total wages.....	\$ 11,340,385
<i>All other employees:</i>	
Total number.....	61,553
Total wages.....	\$ 21,799,251
Cost of materials used.....	124,043,837
Value of products.....	221,217,217

The principal products reported, according to the census of 1900, are shown, in comparison to those of 1890, in the table on the following page.

Among all the chemical products the most important is and has long been sulphuric acid, owing to the supremacy which it maintains over all other known chemicals in the promotion of the great manufacturing interests. A comparison of the quantities produced during the several census years, therefore, as well as a comparison showing the reduction of prices that has obtained, will give the reader a very good general idea of the marvelous advancement that has been made in the manufacture of chemicals in the United States.

Next to sulphuric acid, the most important single item in the list of chemical products during the past two decades is that of manufactured manures. The quantity of fertilizers made in 1890 was somewhat less than 1,900,000

CHEMICAL INDUSTRY

tons, while in 1900, the total production was a little more than 3,000,000 tons, and such figures are particularly interesting because, if for no other reason, they indicate quite clearly the growth and development of the agricultural interests of the country.

In fact, the recent improvements made in the manufacture of fertilizers by the great producers of such materials, to say nothing of the experiments of the agricultural department and other scientists who have been seeking so assiduously to provide even better methods of aiding

COMPARISON OF THE QUANTITIES AND VALUES OF THE PRINCIPAL PRODUCTS REPORTED: 1890 AND 1900

PRODUCTS.	1890.		1900.	
	Quantity.	Value.	Quantity.	Value.
Totals		\$163,547,685		\$221,217,217
Alum, pounds	93,998,008	1,616,710	179,467,471	2,446,576
Coal-tar products		687,591		1,421,720
Dyeing and tanning extracts and sumac, pounds.	187,906,911	8,857,084	169,525,536	7,767,226
Gunpowder and other explosives, pounds.	125,645,912	10,993,131	215,590,719	16,950,976
Fertilizers, tons	1,898,806	35,519,841	3,091,717	45,911,382
Paints, colors, and varnishes.		52,908,252		71,313,392
Potash and pearlash, pounds.	5,106,939	197,507	3,864,766	178,180
Sodas, pounds	333,124,375	5,432,400	1,279,082,000	10,237,944
Sulphuric acid, 50°, pounds	1,009,863,407	4,307,067	1,906,878,903	7,965,832
Sulphuric acid, 60°, pounds	20,379,908	122,940	34,023,131	246,284
Sulphuric acid, 66°, pounds.	354,533,657	3,249,466	754,558,455	6,035,069
Wood alcohol and acetate of lime.		1,885,469		5,775,290
Chemicals (including all acids, bases, and salts not heretofore enumerated)		24,751,974		40,791,690
All other products		13,018,253		4,175,656

Of course, the history of the farming industry in the past has been a record of gross ignorance and prodigal wastefulness, especially in the matter of fertilization. Through carelessness, or, perhaps more often, through want of proper knowledge of his trade, the American farmer has permitted vast quantities of the most valuable manurial materials to soak into the ground where they could be of no use to him, or to find their way to the sea. In the old days, instead of devising some method of preventing such waste in the future, the agriculturist continued his primitive methods, ever bemoaning his lot because his lands gave no greater yields, until, at last, the manufacturer of artificial fertilizers came to his assistance, and, by the aid of chemicals and mechanical devices, converted worthless matter into valuable merchandise.

To obtain a good general idea of the use to which this product of the chemical arts is put by the farmers of the United States it is only necessary to make a brief computation. Thus, for example, we may say that 300 pounds of fertilizers are used to an acre of land, and, as the total output of the country aggregated nearly 6,200,000,000 pounds, it is easy to see that it would require no less than 25,000,000 acres to exhaust such a product. Deducting a certain amount to cover the matter of exportation to other countries, and we still have enough artificial fertilizer used in the United States to have enriched more than 20,000,000 in 1900 alone. As the figures of the agricultural department now show that large areas of this country are already becoming unprofitable as farming lands unless artificial fertilization is to be used to enrich them, and as there is every indication that the time is rapidly approaching when no unmanured soil will yield a remunerative crop to its cultivator, it is not surprising that great manufactories for the making of such materials should have been established in so many sections of the country, notably, of course, throughout the great agricultural districts of the West.

the farmer in his efforts to secure a remunerative crop, there is every reason to believe that the art of making artificial manures has just commenced to show what great achievements it is capable of accomplishing.

The matter of chemical production is composed of such an infinite variety of combinations of raw materials that it is almost impossible to give anything like a detailed view of the subject without going far beyond the restrictions which space fixes upon such an article as this, and yet it is to this variety of raw materials, as well as to its almost numberless combinations, that the chemical industry owes its unique position in the commercial world. Among all known branches of industry there is no branch of manufacture that can be compared to it, either in its scope, in its usefulness, or in the knowledge which it requires from those who prosecute it successfully. Although it is impossible to give all the raw materials and their combinations, therefore, the following list of some of the most important materials, with their derivatives, will cover the ground as well as it can be covered in any such brief review of the subject. The list follows:

RAW AND MANUFACTURED CHEMICALS

RAW MATERIAL.

Brimstone or sulphur; pyrites containing sulphur.
Nitrate of soda.
Salt (common).
Potash salts.

Nickel ores.
Chromic-iron ores.

Antimony ores.
Bismuth ores.
Copper ores.

Cobalt ores.
Iron ores.

MANUFACTURED ARTICLES OR DERIVATIVES.

Oil of vitriol, or sulphuric acid, the most important of all chemicals.
Nitric acid and all nitrates.
Soda; muriatic acid.
Bichromate of potash, prussiate of potash, and many other combinations.
Salts of nickel, for plating.
Chromates of potash and soda.
Alloys; medicinal salts.
Alloys; medicinal salts.
Sulphate of copper, or blue vitriol.
Oxide of cobalt.
Sulphate of iron, or copperas.

CHEMICAL MINERALOGY — CHEMICAL RAYS

RAW MATERIAL.	MANUFACTURED ARTICLES OR DERIVATIVES.
Lead ores.	White and red lead; litharge.
Manganese ores.	Disinfectants; chlorine.
Mercury ores.	Calomel; white and red precipitate; vermilion.
Zinc ores.	Oxide of zinc.
Gold.	Chloride of gold.
Silver.	Nitrate of silver.
Innumerable vegetable productions.	Dyeing extracts; alkaloids; acids; and pharmaceutical preparations.
Linseed.	Paints.
Cotton-seed.	Soap; oils used in cooking.
Cotton.	Guncotton.
Corn and all cereals.	Glucose; alcohol; starch.
Wood.	Explosives; oxalic acid; potash; acetic acid; paper.
Argol, or tartar.	Tartaric acid; cream of tartar.
Borate of lime.	Borax.
Barytea.	Paints.
Chalk.	Whiting.
Iodine.	Sublimed iodine; all iodines.
Limestone.	Lime; carbonic acid.
Magnesia.	Carbonate and sulphate of magnesia.
Ochres.	Paints.
Crude phosphates.	Phosphorus.
Fats.	Soap, glycerine.
Animal matter, horns, hoofs, etc.	Prussiate of potash; artificial manures.
Oils.	Soap; perfumes.
Coal (bituminous).	Ammonia; coal-tar colors; cyanide of potash.
Clays.	Alum.
Corundum.	Aluminum.
Cryolite.	Alum; soda.
Silica or sand.	Silicate of soda; glass.
Tin.	Tin-salts for dyeing purposes.
Atmospheric air.	Oxygen.
Water.	Gas; hydrogen; oxygen.

In the United States the manufacturers of chemicals have such a wide range of territory from which to select their location that they have not infrequently constructed their plant in some position of convenience to their natural products. The markets for such chemical productions, however, are far apart, but they may be classified under a list of such attractive points as the great centres of the textile manufacture, of the dyeing and bleaching works, the great oil refineries, the artificial manure works, etc.

The processes that are used in the making of chemicals are almost as varied as its products, and yet there are certain leading steps that are essential to all of them. Such, for example, are the grinding, furnacing, dissolving, separating, evaporating, filtration, and crystallization processes. In each of these the laws governing chemical constitution are closely followed, while, from time to time, the process is improved by the aid of chemical inventions, the improvements that become more and more necessary as the competition of the age increases the demand for quicker, surer, and more economical methods. Some of the present-day chemical operations are still the result of a long and complicated process. There are instances in which crystallization and decomposition take place very slowly, for both are hastened or retarded by many physical conditions; both heat and cold, like intense motion and absolute quietude, are processes of treatment that are often required by the chemist. Moreover, when we remember that some of these long and complicated processes of treatment, include, perhaps, frequent dissolvings and fully as many crystallizations, it is not difficult to imagine why it should be

necessary for manufacturers to have such an abnormally large capital before they can establish themselves successfully in the industry of producing chemicals.

Moreover, it is not money alone that is needed for one to be able to successfully conduct a manufacturing chemical establishment. A quarter of a century ago money and a little knowledge was all that was required of the ordinary manufacturer. To-day, however, all this has changed. During the past 20 years scientific Germany has devoted much time and attention to chemical researches, and with such good results that the rest of the world's manufacturers have had all they could do to keep abreast of the times. Considering the years numerically the chemical industry was old enough to have been well-established more than 20 years ago. Considered by its achievements, however, it might well be said to have then been in a state of babbling infancy, for it has been almost entirely within the past two decades that the great improvements in this industry have been made. To-day it is the chemical laboratory that is the pulse of the entire factory. It must be well equipped with the most modern apparatus, operated by none but careful workers, for each step in the process is indicated unerringly in the result, and chemical works of any magnitude may reasonably be said to contain and require every manufacturing appliance that is known to or used by man, with the exception, of course, of such machines as have been specially adapted to weaving or printing.

Chemical engineering is another branch of the industry to which much attention has been devoted during the past 20 years, and its importance as a factor in the adjustment of plants to the exigencies of the many difficult and complicated operations to which the works must be adapted, has recently led to the establishment of courses in chemical engineering by several of the leading institutions which devote their attention so largely to matters of technical education.

Chemical Mineralogy. See MINERALOGY.

Chemical Rays, a not very appropriate name given to the rays of higher refrangibility in the spectrum (q.v.). The blue and violet rays of the spectrum, and also the non-luminous rays at the violet end of the spectrum, have a peculiarly powerful chemical effect on silver compounds,—on photographic paper, for instance, which is prepared by moistening soft paper with solution of common salt, and then steeping it in solution of nitrate of silver. The blue, violet, and non-luminous rays at that end of the spectrum quickly blacken such paper when it is exposed to their influence. The remainder of the spectrum has not this power; for example, paper sensitized with silver salts is not attacked at all by yellow light. Hence the name "chemical rays" is given to those above mentioned. The term is, however, misleading, for there are other chemical compounds that are acted on by other parts of the spectrum; and the truth seems to be that for each particular sensitive compound there is one particular part, or sometimes two or three particular parts of the spectrum with maximum chemical influence for the decomposition of it.

CHEMISTRY

Chemistry, the science which deals with the composition and transformations of matter, had its origin in remote antiquity. In its earliest form it was purely empirical, a mass of disconnected facts which were brought to light in the natural course of development of various industries. In the extraction of metals from their ores, in the preparation of drugs and medicines, in the processes of dyeing, and the like, many chemical data were discovered; and of such facts a large number were known to the ancient Egyptians. Indeed, one plausible derivation of the word "chemistry" is from Khem, an early name for Egypt, which has reference to the blackness of its soil. With this name the Arabic word *chema*, to hide, seems to have some relation; and when we remember that much ancient learning was preserved for us by Arabian scholars, the descriptions of chemistry as the Egyptian science, or as the hidden or occult art, become intelligible. Secrecy was a characteristic of its early practitioners.

The one fundamental fact of chemistry is, that matter can undergo apparent transformations of kind, one substance being converted into another. For instance, wood becomes charcoal, and iron is changed to rust; and facts like these were evident even to the most primitive observers. As philosophy developed, these data were necessarily considered, the nature of matter was discussed, and attempts were made to correlate and explain the phenomena. Much of the early speculation was vague and mystical, and has little significance to-day; but a part of it was intensely practical, and gave a definite purpose to investigation. If matter can be transformed from one substance to another, why should not the possibility of change be universal? All metals, it was seen, had certain properties in common, and so transmutability between them was almost taken for granted. Thus alchemy arose, with its search for the philosopher's stone and its attempts to convert base metals into gold; and from alchemy the chemistry of to-day is lineally descended. The discoveries, even the failures of the alchemists laid the foundations of our modern science, and pointed out the best paths for investigation to follow.

The Greek philosophers, and especially Aristotle, in their attempts to interpret matter, assumed the existence of four elements, namely, earth, water, air, and fire. These names, however, denoted properties rather than things, and implied the attributes of coldness, wetness, dryness, and heat. The properties of matter were determined by these conditions, and could be expressed by the varying degrees under which the latter were displayed. Of chemical combination, as we understand it, the ancients seem to have had no clear conception; they sought to solve the problems of the universe by reasoning alone; the experimental method as a test of truth had not become a court of last appeal. To the alchemists, on the other hand, and to their successors, the iatrochemists, who applied chemistry to medical uses, experiment was the essential thing; and in their hands true knowledge rapidly increased. The alchemical elements, salt, sulphur, and mercury, were still names of properties; but they represented conceptions which stood closer to reality than the earlier ideas, since they were based upon more

exact observations. Speculation had not been dethroned, but it was no longer an absolute ruler.

To trace the history of chemistry during its formative period would be impracticable in an article of the present scope. It is enough to say that the modern distinction between elements and compounds was first clearly stated by Robert Boyle in 1661. An element is a substance that cannot be further decomposed, but which is obtainable from a compound body, and from which the latter can again be prepared. He also held that chemical combination consisted in an approximation of the smallest particles of matter, thus adopting the atomic hypothesis which had been current in philosophy from the very earliest times. With these teachings of Boyle modern chemical theory practically began.

The chemical researches of the 18th century were many and varied, but most of them, at least during the earlier decades, were essentially qualitative in character. The fundamental importance of exact weight and measure came into recognition with extreme slowness. Throughout the greater part of the century one theory dominated chemical thought, the theory of *phlogiston*, proposed by Becher, but developed and completed by Stahl. The phenomena of combustion had always attracted the attention of chemists, and the new theory was devised to explain them. Every combustible body was supposed to contain a peculiar non-isolable substance, *phlogiston*; and when combustion took place this substance was thought to be expelled. Thus lead, when heated in the air, undergoes a change analogous to that produced by combustion, and yields a calx, or, as we call it now, an oxide. This calx, combined with phlogiston, was thought to exist in the original metal, and to be freed from phlogiston when calcination occurred. In this speculation no account was taken of the weight of the several bodies, and the fact that the calx was heavier than the metal, that a gain, not a loss was observed, seemed to offer no difficulty to the believers in the phlogistic doctrine. To phlogiston a negative weight was ascribed, and by this device the real difficulties of the problem were comfortably laid aside.

In 1774 Joseph Priestly, himself a believer in phlogiston, discovered oxygen; and so made, though unwittingly, the true interpretation of combustion possible. In 1766 Cavendish had discovered hydrogen; and in 1781 he proved that water was produced by the union of the two new gases. Cavendish also determined the composition of the atmosphere, and in these researches the foundations of a new chemistry were laid. The two chief architects to build upon the foundation were a Frenchman, Lavoisier, and an Englishman, Dalton.

Lavoisier, by careful use of the balance as an instrument of research, proved that matter was constant in weight, and could neither be created nor destroyed. In any chemical change the weight of the substances engaged in the reaction remained unaltered. Studying combustion he showed that it was merely combination with oxygen; and he pointed out that respiration was a phenomenon of the same character. He also gave greater precision to the idea of an element, and announced the elementary nature of the metals; and, in conjunction with

CHEMISTRY

other chemists, did much toward the establishment of a rational system of chemical nomenclature. Hitherto the names of compounds had been arbitrary and often meaningless; now they were made to express with more or less accuracy the composition of the substances described.

Lavoisier died in 1794, a victim of the French Revolution; and it was not until 1803 that the next really great forward step in chemistry was taken by Dalton, who then first announced his famous atomic theory. To support this doctrine, which, being quantitative in form, had little in common with the atomistic speculations of the philosophers, Dalton established two laws, the laws of definite and multiple proportions. That every chemical compound has a fixed and definite composition was recognized by Lavoisier and by other writers before him, but the fact was disputed by Berthollet, and it remained for Dalton to give its statement a precise form. Dalton then went further, and found that to every element a definite combining number could be assigned, and that when two elements united in more than one proportion, even multiples of that number appeared. Thus, taking the hydrogen weight as unity, the standard of comparison, oxygen always combines with other elements in the proportion of eight parts or some simple multiple thereof, and so on through the entire list of elementary bodies. Each one has its own distinct combining weight, and this was a condition which Dalton sought to explain. Fractions of the weights did not occur, fractional atoms could not exist, and the two thoughts were connected by Dalton. Chemical union, to his mind, became a juxtaposition of atoms, whose *relative* weights were indicated by their combining numbers; and so the atomic conception was for the first time given a clear, quantitative expression. First, every element is composed of similar atoms which have constant weight. Secondly, chemical compounds are formed by the union of these atoms in simple numerical relations. Upon these fundamental statements the entire system of chemical philosophy rests, so that for a hundred years the history of chemistry has been the history of the atomic theory. All chemical calculations are based upon the atomic weights of the elements, and in all chemical formulæ they are implied.

Since Dalton's time great labor has been expended upon the exact determination of atomic weights, and in the discovery and description of new elements and compounds. The general conclusions which have been established by this class of researches may be summarized as follows: Every chemical substance is either an element or a compound. The elements, which are not separable into any simpler bodies, at least by no means yet discovered, are comparatively few in number; the compounds are innumerable. More than a hundred thousand compounds are already known. A compound may be separated into its elements or built up from them; and its composition is absolutely invariable. In this respect compounds differ from mechanical mixtures, in which any proportion may occur. Flour and sugar may be mixed together, but they still remain flour and sugar, each with its properties unchanged; no combination here takes place. In combination, as when *gaseous* hydrogen and *gaseous* oxygen unite to

form *liquid* water, they do so only in one fixed proportion and the characteristics of the original substances disappear. This fact of combination, the union of two or more bodies to form others which are widely different from them, is clear; but its mechanism is not yet understood. The elementary atoms of the compound are drawn and held together by some form of attraction, but its precise nature is unknown. The object of chemistry is to discover the laws which govern the union or the decomposition of substances, and to determine the limits within which such changes are possible. For the study of compounds, at least for the purpose of ascertaining their composition, two methods are employed. First, *analysis*, in which the component parts of the compound are separated, and individually identified. Secondly, *synthesis*, in which the parts are forced to unite, and to form the compound which happens to be under investigation. Furthermore, analysis may be either *qualitative* or *quantitative*. In one case we merely ascertain what substances are present, in the other we determine their exact quantity. The elements now known, about 80 in number, are given in the following table, together with their atomic or combining weights and their symbols. The latter are abbreviations whose use will be explained presently.

ELEMENTS, SYMBOLS, AND ATOMIC WEIGHTS.

Element	Symbol	Atomic Weight
Aluminum.....	Al	26.9
Antimony.....	Sb	119.3
Argon.....	A	39.6
Arsenic.....	As	74.4
Barium.....	Ba	136.4
Bismuth.....	Bi	206.9
Boron.....	B	10.9
Bromine.....	Br	79.36
Cadmium.....	Cd	111.6
Cæsium.....	Cs	132.0
Calcium.....	Ca	39.8
Carbon.....	C	11.91
Cerium.....	Ce	139.0
Chlorine.....	Cl	35.18
Chromium.....	Cr	51.7
Cobalt.....	Co	58.56
Columbium.....	Cb	93.3
Copper.....	Cu	63.1
Erbium.....	Er	164.8
Fluorine.....	F	18.9
Gadolinium.....	Gd	155.0
Gallium.....	Ga	69.5
Germanium.....	Ge	71.9
Glucinum.....	Gl	9.03
Gold.....	Au	195.7
Helium.....	He	4.0
Hydrogen.....	H	1.0
Indium.....	In	113.1
Iodine.....	I	125.90
Iridium.....	Ir	191.5
Iron.....	Fe	55.5
Krypton.....	Kr	81.2
Lanthanum.....	La	137.9
Lead.....	Pb	205.35
Lithium.....	Li	6.98
Magnesium.....	Mg	24.18
Manganese.....	Mn	54.6
Mercury.....	Hg	198.5
Molybdenum.....	Mo	95.3
Neodymium.....	Nd	142.5
Neon.....	Ne	19.9
Nickel.....	Ni	58.3
Nitrogen.....	N	13.93
Osmium.....	Os	189.6
Oxygen.....	O	15.88
Palladium.....	Pd	105.7
Phosphorus.....	P	30.77
Platinum.....	Pt	193.3
Potassium.....	K	38.86
Praseodymium.....	Pr	139.4
Radium.....	Ra	223.3

CHEMISTRY

Element	Symbol	Atomic Weight
Rhodium.....	Rh	102.2
Rubidium.....	Rb	84.8
Ruthenium.....	Ru	100.9
Samarium.....	Sm	148.9
Scandium.....	Sc	43.8
Selenium.....	Se	78.6
Silicon.....	Si	28.2
Silver.....	Ag	107.12
Sodium.....	Na	22.83
Strontium.....	Sr	86.94
Sulphur.....	S	31.83
Tantalum.....	Ta	181.6
Tellurium.....	Te	126.6
Terbium.....	Tb	158.8
Thallium.....	Tl	202.6
Thorium.....	Th	230.8
Thulium.....	Tm	169.7
Tin.....	Sn	118.1
Titanium.....	Ti	47.7
Tungsten.....	W	182.6
Uranium.....	U	236.7
Vanadium.....	V	50.8
Xenon.....	Xe	127.0
Ytterbium.....	Yb	171.7
Yttrium.....	Yt	88.3
Zinc.....	Zn	64.9
Zirconium.....	Zr	89.9

In addition to these elements there are several others which are as yet imperfectly known and uncertain. Among them, polonium, actinium, holmium, europium, and dysprosium may be named. New elements are not infrequently discovered, and argon, helium, neon, xenon, krypton, and radium have all been brought to light within the last decade.

With the help of the elementary symbols, chemical formulæ can be constructed, and these are of great help in chemical calculations and reasoning. Some of the symbols are initial letters only, as H, O, N, C, for hydrogen, oxygen, nitrogen, and carbon; others are formed of two letters, like Ca for calcium and Zn for zinc. Still others are derived from the Latin names of the metals, such as Ag from *argentum*, silver, Fe from *ferrum*, iron, etc. The formula of a compound is made by writing the proper symbols in juxtaposition, so that NO means a compound of nitrogen and oxygen, HI a compound of hydrogen and iodine, and so on. When two elements form more than one compound, these are distinguished by subscript numerals, as in the examples PCl_3 and PCl_5 . In these substances one atom of phosphorus unites with three and five atoms of chlorine respectively. In every case the symbol of an element means one atom of the element, and therefore that relative quantity of it which is indicated by its atomic weight. In water, H_2O , two atoms of hydrogen weighing two units, combine with one atom of oxygen weighing in round numbers sixteen units; and thus the formula tells us in shorthand that the compound contains two parts of one element to sixteen of the other. No matter how complex a formula may be, this simple rule invariably applies, and by its means the composition of the substance represented can be calculated. The symbols, moreover, can be combined into equations, from which we may compute the outcome of a given chemical process. This subject, however, is much too abstruse for discussion here. Its details are developed logically from the atomic theory.

To the philosophers who preceded Dalton an atom was the smallest particle of any sub-

stance which could possibly exist. Thus water might be subdivided and subdivided until, in theory, a limit was attained, and an atom of water was the result. By chemical means a new order of divisibility had now to be recognized, and the supposed "atom" of water was itself found to be complex, and separable into still smaller particles of oxygen and hydrogen. The latter are the atoms of the chemist; the former clusters of atoms are known as *molecules*. This distinction was not developed immediately; its full recognition came slowly, and it derived its importance from certain laws relative to gases which were discovered, partly by Boyle, partly by Gay Lussac, and generalized in 1811 by Avogadro. Avogadro's law may be concisely stated as follows: Equal volumes of gases under like conditions of temperature and pressure, contain equal numbers of molecules. A molecule is now defined as the smallest particle of any substance which can separately exist; an atom as the smallest particle which can take part in chemical change. Another law, discovered by Dulong and Petit in 1819, was also highly important, for it was shown that the specific heat of an element was inversely proportional to its atomic weight. In other words, the elementary atoms have all the same capacity for heat, and this rule gave us an important check in ascertaining the true weights of the atoms. The law of Avogadro and the law of Dulong and Petit were brought together by Cannizzaro in 1858, and the system of atomic weights and chemical formulæ now in use, which differ in certain essential particulars from those that were first adopted, was the result of the combination.

In the early days of scientific chemistry the science was divided into two great sections, organic and inorganic, the one dealing with animal and vegetable products, the products of life, and the latter with substances derived from the mineral kingdom. Inorganic chemistry, the chemistry of the metals, the earths, the commoner oxides, bases, and salts, was for the time being the simpler, and during the first half of the 19th century it received the lion's share of attention. At first it was supposed that the two fields of research were absolutely distinct, and that no organic compound could be derived by artificial means from inorganic sources. This belief was overthrown by Woehler, in 1827, who showed that urea, an organic body, was easily prepared from inorganic ammonium cyanate, and since then a vast number of organic syntheses have been effected. Curiously enough, urea and ammonium cyanate, although very different substances, have the same percentage composition, containing the same elements in exactly the same proportions. Later it was found that *isomerism*, as this semi-identity is called, was exceedingly common, and here was a noteworthy phenomenon which called for explanation. Different molecules could be constructed from the same set of atoms, and the simplest interpretation of the fact was that the latter were differently arranged. Out of the same bricks different houses may be erected. The conception of *chemical structure*, therefore, came into being. What is the arrangement or grouping of the atoms within any given molecule?

The earlier attempts at the solution of this

CHEMISTRY

problem have now only historical interest, and their consideration is of value to professional students of chemistry alone. If we were to trace the successive stages we should find evidence of a systematic growth in chemical theory; but definiteness was hardly possible until after Cannizzaro had established the true system of atomic weights, and formulæ had been adjusted in accordance with them. Between 1850 and 1860, however, a new property of the atoms began to be recognized, and this, taken in connection with the formulæ based on Avogadro's law, was the key to the problem. The theory of *valence*, which is the expression of the newly discovered property, is as follows. Every atom, as regards its union with other atoms, has a certain atom-fixing power, which is known as its *valency*, or *valence*.

Let us take hydrogen as our standard of reference and consider some of its simplest compounds. In HCl, hydrochloric acid, one atom of hydrogen is united to one of chlorine. So also we have HBr, and HI, KCl, and NaCl, AgBr, etc. These elementary atoms, which combine only in the ratio of one to one, at least to form permanent compounds, are *univalent*, that is, their power of fixing or uniting with other atoms is unity. In water, on the other hand, H₂O, a single oxygen atom holds two of hydrogen in combination, and so oxygen is called a *bivalent* element. In H₂S, CaCl₂, ZnI₂, we have illustrations of still other compounds in which a bivalent atom is united with two of the univalent type. Nitrogen, phosphorus, arsenic, aluminum, and some other elements go still farther, and are *trivalent*, so that the compounds formed by them have such formulæ as NH₃, PH₃, AsH₃, AlCl₃, and so on. Carbon, a *quadrivalent* substance, forms normally compounds of still more complex type, such as CH₄, CCl₄, or, when it unites with two *dyad* or bivalent atoms, CO₂ and CS₂. For brevity, the valency of the various elementary atoms may be indicated by speaking of them as *monads*, *dyads*, *triads*, *tetrads*, etc. The rare metal vanadium is a *pentad*, having a valency of five, and *sexivalent* tungsten is a *hexad*. In many cases valency seems to be a variable property of the atom, as, for example, when we consider the two chlorides of phosphorus, PCl₃ and PCl₅. In cases like these the higher figure may be taken as showing the maximum atom fixing power of the element, a power which is only partially exercised in the lower compounds.

In the theory as thus stated there is no mere speculation; it is a statement of definitely observed facts. It tells us that the atoms unite, not arbitrarily, but in accordance with certain rules; and these help us in our comprehension of known compounds and the discovery of new ones. Indeed, an enormous advance in chemical discovery followed the application of these principles: an advance not only of scientific importance, but of economic and commercial value also. It was in the domain of organic chemistry that the growth became most immediately evident, and to this branch of the science we may now turn our attention. It is here that we find the best illustrations of what is meant by chemical constitution or structure, and the best examples of isomerism.

It has already been pointed out that organic chemistry, in its beginnings, dealt with animal

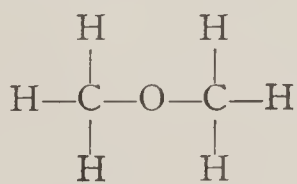
and vegetable substances, the products of living organisms. Other artificial bodies, derived from these, were also included in its territory. All organic compounds were characterized by the presence in them of carbon, this element being ordinarily combined with hydrogen, oxygen, nitrogen, or all three, and sometimes with other elements also. Organic chemistry, as its domain was enlarged, in time received a new definition, and to-day the term broadly signifies *the chemistry of carbon compounds*. It is true that some compounds, such as the metallic carbonates, are more conveniently described as inorganic in character; but these minor exceptions affect the definition but slightly.

At first sight the almost innumerable organic substances appear to be hopelessly complex, and some, indeed, such as albumen, are so; but a closer inspection reveals order among them, and, in general, an ultimate simplicity. Their great number is due to the fundamental properties of the carbon atom, which, being quadrivalent, can unite with four other atoms simultaneously; and which, moreover, may combine with other atoms of its own kind to form rings or chains that serve as nuclei for the development of long series of substances. Most of the latter are derived from *hydrocarbons*, compounds of carbon and hydrogen, and these are exceedingly numerous. Marsh gas or methane, CH₄, contains the largest proportion of hydrogen, and is the type upon which the quadrivalency of carbon is predicated; it is, furthermore, the first member of a series of hydrocarbons, CH₄, C₂H₆, C₃H₈, and so on up to C₃₅H₇₂, and perhaps even farther. In this series each compound contains one atom of carbon and two of hydrogen more than the hydrocarbon preceding it, and this regular difference establishes what is known as an *homologous* series. Nearly all organic substances can be arranged in series of this kind, so that the chemist is able to master a great number of details by a single effort of the memory. Moreover, the members of each homologous series vary regularly, step by step, in their physical properties. Thus CH₄ is a gas, C₂H₆ a heavier gas, C₅H₁₂ a volatile liquid, the following terms are liquids which grow less and less volatile, while above C₁₈H₃₈ the hydrocarbons are waxy solids. Ordinary paraffin is a mixture of these higher hydrocarbons, and the whole group, therefore, is known as the paraffin series. Common petroleum consists chiefly of its liquid members. From these hydrocarbons, with oxygen, a parallel series of *alcohols* is derived: such as CH₄O, methyl or wood alcohol, C₂H₆O, ethyl or ordinary alcohol, C₅H₁₂O, amyl alcohol or fusel oil, etc. By further oxidation the alcohols yield a set of acids, among which acetic acid, the acid of vinegar, is the one most familiarly known. This single series of hydrocarbons is the key to thousands of other substances which are directly producible from them. Some of these products illustrate very simply a mode of derivation which is known as *substitution*, as when, from CH₄, hydrogen atoms may be successively withdrawn and replaced by univalent atoms of chlorine. Thus we get the following compounds: CH₄, CH₃Cl, CH₂Cl₂, CHCl₃, and finally CCl₄; the fourth one being the familiar body chloroform. So also acetic acid, C₂H₄O₂, by substitution with chlorine, gives C₂H₃ClO₂, C₂H₂Cl₂O₂, and C₂HCl₃O₂; but here

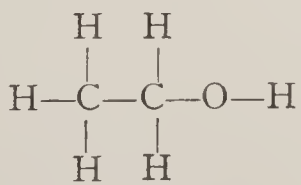
CHEMISTRY

the process stops and cannot be carried further. The one remaining atom of hydrogen in acetic acid is differently combined from the others, and here we begin to see the sort of evidence by which differences of chemical structure may be determined. When we study great numbers of organic compounds, especially with regard to their possibilities of chemical change, we find that certain combined atoms behave differently from other combined atoms of like kind. We also discover groups of atoms which can be shifted collectively from compound to compound; clusters which act almost like elements and are perfectly definite in their nature. The group NH_4 is so much like a metal in its compounds that it is given a distinct name, *ammonium*, and is conventionally treated as if it were really a metallic body. CN , cyanogen, resembles chlorine in some of its relations, and such groups as CH_3 , methyl, and C_2H_5 , ethyl, are encountered at every turn. They do not exist separately, but only in combination, and are known as *compound radicles*. Every such radicle has valency, and this is essentially residual in its nature. Thus in methyl, CH_3 , three of the four units of affinity belonging to the carbon atom are satisfied by hydrogen, leaving one unit unemployed. Methyl, therefore, is a univalent radicle, and acts almost as if it were an independent element.

The chemical formulæ which we have so far considered belong to the class known as *empirical formulæ*; they give the number and kind of atoms in a molecule, but tell nothing as to their arrangement or mode of union. With the conception of valency and a knowledge of radicles we are now prepared to construct *rational* or *constitutional* formulæ, and from these it is possible to infer what sort of changes a given molecule can undergo, and to understand wherein isomeric bodies differ. For example, there are two bodies having the empirical formula $\text{C}_2\text{H}_6\text{O}$; one, methyl ether, is a gas; the other, common alcohol, is liquid; the great difference between them is evident at a glance. Their rational or structural formulæ exhibit the cause of difference as follows:



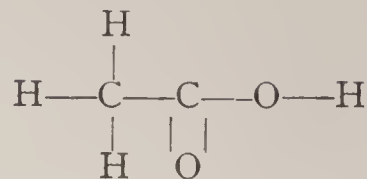
Methyl ether.



Ethyl alcohol.

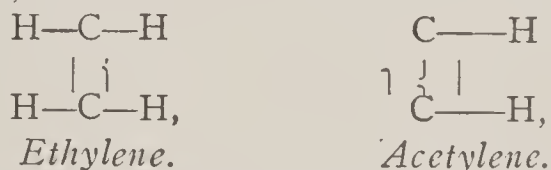
In the first, two methyl groups appear united by an atom of oxygen; in the other, the carbon atoms are directly combined, and the bivalent oxygen connects carbon and hydrogen. The lines which connect the symbols represent units of valency, and the groups CH_3 in one case and C_2H_5 in the other stand for well-known radicles. For further illustration we may recur to the case of acetic acid, in which, as we have seen, three hydrogen atoms behave differently from the

fourth. This condition is shown in the following structural expression:



Here we see the three replaceable atoms directly connected with carbon, while the fourth is linked to oxygen; the latter element also being combined in two ways. The known facts are clearly and simply presented to the eye by a convenient symbolism, a method of formulation which has been of immense value as a guide to practical research. In order to succeed, an experiment upon any of these compounds must be in accord with the facts of molecular structure, for the latter indicate limitations which cannot be disregarded.

In two of the foregoing formulæ the linking of carbon with carbon is clearly indicated, but only by single units of valency, or *bonds* as they are sometimes called. In other cases, however, more complex unions occur, and double or triple linkages are common. The formulæ for two hydrocarbons may be cited to illustrate this principle, thus:



The second of these bodies is now widely known as an illuminating gas. Each compound is the starting point of an homologous series, exactly as with the paraffins; but the ethylene series exhibits a striking peculiarity. If we add to ethylene successive CH_2 groups, which characterize chemical homology, we get a sequence represented by such formulæ as C_2H_4 , C_3H_6 , C_4H_8 , and so on indefinitely. In all of these compounds the ratio between carbon and hydrogen is the same, and their percentage composition is identical; such a series is called *polymeric*. The different members of the series, however, yield different derivatives, and they are further distinguished from one another by their *molecular weights*, the weight of the molecule being the sum of the weights of the atoms contained in it. These molecular weights can be directly measured by ascertaining the actual weight of definite bulks of the several substances in the condition of gas or vapor. According to Avogadro's law, equal volumes of gases contain equal numbers of molecules; if, therefore, a litre of one gas is twice as heavy as a litre of another, the weight of its molecule must be double that of the latter. By experiment, then, we can determine the relative weights of molecules, and so discover whether a compound is formed from a larger or smaller group of atoms.

One other class of organic substances demands attention here, the so-called *aromatic bodies*, which start from the hydrocarbon C_6H_6 , benzene. In the compounds previously considered the carbon atoms are united in a chain-like manner, but in benzene there is good reason to assume that they form something like a ring. Around this ring of carbon atoms the hydrogen atoms are grouped, and by successively replacing them with other atoms or radicles, a myriad of substances may be generated.

CHEMISTRY

The details of this theory, which was put forth by Kekulé in 1866, are too abstruse for full development here, but its influence upon chemical research and chemical industry has been overwhelming. From benzene, which is a product of coal-tar, aniline is produced; and the derivatives of aniline give us a perfect rainbow of artificial dyes. To benzene, other hydrocarbons are closely related, and their derivatives are often curiously interesting. Among them we have artificial indigo and artificial alizarin, the latter being the coloring principle of madder. Both compounds are identical with the natural substances, and both are important commercial products. Medicines, like saccharin, antipyrin, acetanilid, and phenacetin; perfumes, like musk and violet; and flavoring substances, such as vanillin, are now prepared by synthesis from the hydrocarbons of coal-tar, and thousands of workmen find employment in the new industries which are based upon these processes. The investigations which created these new sources of wealth have been in great part guided by theoretical considerations, and at the very foundation of all this work we find the conception of chemical structure, and Kekulé's interpretation of the constitution of benzene. The atomic groupings represented by the structural or rational formulæ are not visionary, and their study has led to the greater material well-being of mankind.

It must not be supposed that the rational formulæ represent the arrangement of the atoms in space, for that is not their purpose. It is not likely that the atoms of a molecule all lie in one plane, and yet these formulæ suggest no other mode of grouping. The tridimensional structure of molecules is, generally speaking, almost entirely unknown; and yet, in certain cases, there are clues to a partial solution of the problem. Various organic substances have optical properties which are easiest explained by assuming that the atom of carbon is essentially a tetrahedron in form, and that its four valencies are forces exerted from the centre toward the four solid angles of the body. By means of this hypothesis many curious facts are interpreted, and many new discoveries have been made. Formulæ based upon the tetrahedral carbon atom are called *stereochemical* formulæ, and the study of their space relations is named *stereochemistry*. This subject is quite modern and does not admit of detailed discussion here.

That the elements are connected with one another by various relationships is a fact which was early recognized; they were therefore soon classified into groups according to their likenesses. Thus chlorine, bromine, and iodine are closely allied, and form strikingly similar compounds; lithium, sodium, and potassium resemble one another very clearly, and so too do the metals, calcium, strontium, and barium. Such a grouping was of great service in classifying many chemical facts, and in due time it was seen to be related to the property of valency. A general law connecting all the elements was, however, not discovered until the decade ending in 1870, during which time three investigators, Newlands, Mendeleéf, and Lothar Meyer, working independently, developed the *periodic system*. Upon arranging the elements in the order of their atomic weights, a regular periodic variation in their properties appeared, and the full-

est interpretation of it was due to Mendeleéf. The nature of his work may be partly shown as follows:

Beginning with lithium and arranging the elements in the order above indicated, a table of the following form can be constructed, although only three lines of it are given here:

I. Li. 7.	II. Gl. 9.	III. B. 10.9	IV. C. 11.9	V. N. 13.93	VI. O. 15.88	VII. F. 18.9	VIII. Ne. 19.9
Na. 22.88	Mg. 24.18	Al. 26.9	Si. 28.2	P. 30.8	S. 31.8	Cl. 35.2	A. 39.6
K. 38.9	Ca. 39.8	—	Ti. 47.7	V. 50.8	Cr. 51.7	Mn. 54.6	etc.

Under the symbol of each element its atomic weight is written, rounded-off, in some cases, for convenience. Let us now consider the first line. Lithium, which begins the scheme, is univalent, glucinum bivalent, and carbon quadrivalent, a regular increase in valency. Nitrogen is in its stablest compounds trivalent, oxygen bivalent, and fluorine univalent; thus showing a steady decrease. Neon, which was not known in Mendeleéf's time, and argon, which falls just below it, are elements of *no* valency, and these form no compounds. These elements, with their regular rise in valency to carbon and fall to neon, form a single period. In the next line, beginning with sodium (Na), the process is repeated; and this happens again in the third line; so that all of the elements in the same vertical column are alike in valency and intimately related in their properties and their compounds. Regular step-by-step variation horizontally, and likewise vertically, characterizes the table, which may, with certain qualifications, be extended so as to include all the elements known.

At the third place in the third line of the table, as given above, a blank appears. This place, when Mendeleéf developed his *periodic law*, was occupied by no known element; and in the fourth period of the completed scheme two similar gaps occurred. These indicated unknown elements, and Mendeleéf, from the properties of the adjacent elements, predicted what their properties should be. Since then the prediction has been verified; and three new metals, having all the properties which Mendeleéf foresaw, fill the vacant places. They are scandium, gallium, and germanium. The connection between the elements was more intimate than anyone had supposed, so much so that the unknown could be accurately prophesied. All physical properties appear to rise and fall from element to element in this regular periodic way; and we can now see what sort of elements are likely to be discovered in the future, and where they will stand in the tabular arrangement. The properties of an atom, thermal, electrical, optical, etc., seem to be in great measure dependent upon its weight. The distinctly chemical property of the atom, its valency, may be related to its form, as stereochemical evidence would seem to indicate; but here we have few facts to go upon, and speculation would be premature.

The wonderful regularities of the periodic law, with its verified predictions, lead us at once to reiterate the old question as to the ultimate nature of matter. Is it really various in kind, or is it at bottom only one? Are the elements, in the last analysis, elementary? To

CHEMISTRY

such questions no final answer can yet be given, but they cannot be silenced; and one of the most marvelous discoveries of science has some bearing upon the problem.

When a beam of white light passes through a glass prism, it is broken up into a bundle of rays which give to the eye the so-called seven primary colors. If this phenomenon be observed through the form of instrument called a *spectroscope*, a continuous band of color is seen ranging from red at one end to violet at the other. Suppose, now, that instead of examining white light, we repeat the experiment with a colored flame and see what will happen. Sodium compounds, for instance, when introduced into a non-luminous gas flame, give out an intense yellow light; and this, viewed through a spectroscope of low power yields a *spectrum* consisting of a single, narrow, yellow line. Lithium, under similar conditions, exhibits a red line; barium, a group of several green and yellow lines; and, in short, every substance which is capable of coloring a flame gives a spectrum which is not continuous. Each spectrum is made up of bright, colored lines, with dark spaces between; and every line is absolutely characteristic of its source. Every element, provided it be first heated hot enough to be converted into vapor, yields its own definite spectrum of one or many lines, which can be recognized in a spectroscope. The vapor of iron, as obtained in an electric spark between iron terminals, gives a spectrum containing a multitude of bright lines, and every one of them belongs only to iron. The process by which substances are thus identified is known as *spectrum analysis*; and it was discovered by Bunsen and Kirchhoff a little over 40 years ago. Bunsen applied the method to the analysis of the salts contained in a mineral water, and saw lines which belonged to no known element. He was thus led to find two new metals, rubidium and caesium, and soon afterward, by similar means, other chemists discovered thallium and indium.

Shortly after its invention the spectroscope was turned toward the heavenly bodies, in order to see what tales their light had to tell. It was at once found that they are all composed of matter like that with which we are familiar on the earth, although varying in complexity. The sun was proved to be an intensely heated body, containing a large number of our chemical elements in gaseous form, and the fixed stars were similar in character. The whiter and hotter stars contain comparatively few substances, the colored and cooler stars contain more. The nebulae, those bodies which represent the first step in the formation of planets and systems, were found to be vast clouds of incandescent gaseous matter, in which hydrogen and nitrogen predominated; chemically, therefore, they were extremely simple. From the simplest nebula to the complexity of our earth there was regular chemical gradation, suggesting that the evolution of the one from the other had been accompanied by an evolution of the so-called elements also. A strong argument in favor of the unity of matter was thus brought to light, even though absolute proof was wanting. The general opinion now is that our elements are really complex, al-

though our present resources are not adequate to decompose them.

Very recently this opinion has been strengthened by a group of remarkable discoveries connected with the rare metals, thorium and uranium. These elements and their compounds were found to emit invisible radiations, or emanations, which affect the photographic plate, and also possess certain measurable electric properties. This trait of *radioactivity*, as it is called, led to the discovery of two or three new metals, which are associated in the mineral kingdom with uranium, and one of these, radium, has the new power to an extraordinary degree. The radiations are of several kinds; and are still the subject of active investigation; but one or two of the conclusions so far reached are pertinent to the present discussion. In the case of thorium, according to Rutherford, the emanation consists of chemically inert gaseous particles which are continually being generated and given off from the parent material. The element thorium seems to contain something which is not thorium. So also J. J. Thomson, studying electrified gases, is led to the conclusion that the negative charge resides upon certain *corpuscles*, as he terms them, which are not more than the thousandth part of an atom of hydrogen in magnitude, and which are the same for all substances. Particles smaller than the chemical atom are thus being identified, and so the belief in the actual complexity of the elements is receiving close attention.

Although the principles of valency and the conception of chemical structure are best developed and exemplified in the study of organic compounds, the inorganic side of chemistry is by no means to be neglected. Here we find the simplest illustrations of chemical nomenclature, and some of the greatest fields of industrial activity. Sulphuric acid, soda, bleaching powder, and many other inorganic substances are of immense commercial importance; and the processes by which metals are extracted from their ores all fall within this department of chemistry. Information upon these practical subjects will be found elsewhere, under the proper headings, such as IRON; PHOSPHORUS; SALT; SODA; etc.; but a few general notions belong here.

The nomenclature of inorganic chemistry is quite simple. Compounds of two elements are described by giving their names and adding the termination *ide* to part of the second title. For example, copper unites with oxygen to form copper *oxide*; zinc and chlorine give zinc *chloride*, and so on, the names thus expressing the composition of the substances. When multiple proportions appear a numeral prefix is added to the class name, so that we have such combinations as iodine *monochloride*, ICl , iodine *trichloride*, ICl_3 , and the like. In some cases this mode of nomenclature is varied, as when certain well-defined classes of compounds are to be described. Thus we have the iron compounds FeCl_2 and FeCl_3 (the symbol Fe from ferrum), which are commonly called *ferrous* and *ferric* chloride respectively. The terminations *ous* and *ic* denote lower and higher stages of union and are used for convenience or euphony when the regular nomenclature might be awkward. Such compounds as PCl_3 and PCl_5 may be named either *phosphorous* and

CHEMISTRY

phosphoric chloride, or phosphorous trichloride and pentachloride, according to preference; but the latter form is the more precise and clear. Any compound of a metal with oxygen, then, is an *oxide*; with chlorine, a *chloride*; with sulphur, a *sulphide*, etc.

Three of the largest and most important classes of compounds are *acids*, *bases*, and *salts*. In order to define these rigorously, some previous knowledge of chemistry is required; but an indication of their character is easily given. The acids, as their name implies, are usually sour in taste, but not invariably so, and the stronger members of the class are violently corrosive and able to dissolve metals. They are most commonly derived from the non-metallic elements, and several acids may be formed from one of the latter. Here again we have the *ous* and *ic* nomenclature, as in sulphurous acid, H_2SO_3 , and sulphuric acid, H_2SO_4 ; the latter containing the higher proportion of oxygen. From nitrogen we get nitrous and nitric acids, HNO_2 and HNO_3 , and so on with simple descriptive names throughout the long list of these compounds.

The *bases* are the direct opposite of the acids in their properties, and have, when soluble in water, an alkaline or soapy taste. The taste of ordinary kitchen soda is a good example of this peculiarity. Certain vegetable coloring matters are changed in hue by acids and alkalies, the latter name being applied to the stronger soluble bases. Blue litmus, for instance, becomes red in contact with an acid, but an alkali restores its original tint. When acid and base are mingled in proper proportions, they *neutralise* each other, and a *salt* is produced which no longer affects litmus. To illustrate further: soda is a base, and when it is mixed with sulphuric acid it generates sodium *sulphate*. With sulphurous acid it yields sodium *sulphite*; and the two terminations *ate* and *ite* correspond to the other terminations *ous* and *ic*. Nitric acid, with bases, forms nitrates; acetic acid, acetates, etc., the nomenclature being simple and easy. Many of the salts are important commercial articles.

From one point of view an acid is a substance which contains hydrogen replaceable by a metal, and a salt is the compound so produced. Zinc, for instance, dissolves in sulphuric acid to form zinc sulphate, and free, gaseous hydrogen, is liberated. An acid, then, contains hydrogen plus something else, and the latter is a distinct radicle in each case which exhibits a definite valency. The subjoined formulæ may help to make this point clear:

<i>Nitric acid.</i> HNO_3 . <i>Potassium nitrate.</i> KNO_3 .	<i>Sulphuric acid.</i> H_2SO_4 . <i>Potassium sulphate.</i> K_2SO_4 .	<i>Phosphoric acid.</i> H_3PO_4 . <i>Potassium phosphate.</i> K_3PO_4 .
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That is, potassium (symbol K from kalium) replaces hydrogen atom for atom; and the radicles NO_3 , SO_4 , and PO_4 are univalent, bivalent, and trivalent respectively. A knowledge of these simple principles enables the chemist to classify the facts in his mind, and to write numberless formulæ without overloading his memory with details. Learning these principles is like learning a language, only the grammar is easy of

acquisition. Fluency in its use can only be gained by practice.

Between allied departments of science no sharp dividing line can be drawn, and this is peculiarly true with respect to chemistry and physics. The two sciences merge one into the other by imperceptible gradations, and neither can be fully understood separately. Physics treats primarily of the different forms of energy, light, heat, electricity, mechanical force, etc., and all of these appear in the phenomena of chemical change. Furthermore, chemical substances are described in physical terms, and are identified by physical properties such as weight, color, specific heat, melting point, boiling point, electrical conductivity, and the like. Considerations of this kind have received much attention during recent years, more than ever before; and so a great department of knowledge has been developed, known as *physical chemistry*. Avogadro's law, the periodic law, and the revelations of the spectroscope all fall partly within this field, but other important portions of it deserve some notice here.

Between chemical change and heat the relation is exceedingly intimate. No chemical change takes place without either the liberation or the absorption of heat, and every one is in some measure dependent upon temperature. At very low temperatures, like the temperature of liquid air, all chemical action ceases, and the most oppositely energetic substances lie side by side indifferent to one another. At very high temperatures all unions are broken up, and here again the chemical forces cease to be operative. Most of the changes which we observe are effected at ordinary temperatures, and a slight warming may rouse an apparently inert mixture to chemical activity. The application of heat, then, may either instigate or prevent chemical union, according to circumstances.

As a general rule, with some apparent exceptions, every chemical union develops heat and every decomposition absorbs it; and the study of these relations has received the special name of *thermochemistry*. Furthermore, every chemical change is attended by its own special, definite quantity of heat, and these quantities vary from substance to substance. Hydrogen, burning, that is, combining with oxygen, gives out the largest amount of heat of any substance known; carbon yields much less, phosphorus or sulphur less still, weight for weight being consumed. For such reasons the heat value of any fuel depends upon its chemical composition, and hence careful analyses of coal, which is a variable mixture containing chiefly carbon and hydrocarbons, have great practical importance. From the composition of a coal its *calorific value* may be calculated, although a direct experimental measurement of it is to be preferred. In general laws, however, thermochemistry is still rather deficient, and its larger meanings are yet to be discovered.

Like heat, radiant energy, the energy of light, may cause either chemical union or chemical decomposition. Hydrogen and chlorine, mingled in cold and darkness, do not readily unite, but upon sudden exposure to strong sunlight they combine with explosive violence. On the other hand, silver salts, under suitable conditions, are broken up by light, and upon this fact the art of photography is founded. The

CHEMISTRY

photographic film is a laboratory in which light is the chemist. We have already seen, in considering spectrum analysis, that every substance, when intensely heated in the form of gas or vapor, emits light which is peculiar to itself; but there are still other relations between matter and light that have chemical importance. Color is merely the capacity for selecting or absorbing certain rays, and rejecting or transmitting others; and this is often a characteristic distinction between various classes of compounds. For example, salts of cobalt are commonly red, of nickel green, of copper blue or green, and so on. Many of the optical properties of substances seem to depend upon their chemical composition, and in one set of phenomena this fact has economic importance. Certain bodies have the power of twisting or rotating a ray of polarized light, and among carbon compounds this property is directly connected with stereochemical structure. Sugar is one of these optically *active* compounds, and by measuring the amount of rotation which a sample can produce its degree of purity may be determined. This process is practically applied in all sugar refineries for estimating the value of raw sugars or syrups, and also in assessing customs duties. The polariscope used for such purposes is often called a saccharimeter.

Of late years chemistry has been greatly developed upon its electrical side, both theoretically and practically. Electricity may be generated by chemical change, and this happens in all forms of the galvanic battery. For many years, previous to the perfecting of the dynamo, batteries of that class supplied all the electrical power that had any industrial significance. Electricity may also produce chemical change, and it is especially effective in bringing about decompositions. Indeed, many thinkers have sought to identify chemical attraction or affinity with electricity, and even the property of valency is often ascribed to electrical charges carried by the atoms.

From a purely chemical point of view, probably the most important electrical phenomena are those of *electrolysis*. When a current of electricity passes through a compound solution, the latter undergoes decomposition, and the dissolved substance, acid, base, or salt, is separated into two parts which move with unequal velocities in opposite directions. The conducting liquid is called an *electrolyte*, and the separated parts, or rather particles of the compound in solution, are termed its *ions*. One ion is positively, the other negatively electrified, and hence they tend to accumulate around the opposite poles. Under suitable conditions, the separation can be made permanent, and this fact is the basis of all our processes in electrometallurgy. From solutions of gold, silver, copper, nickel, etc., the metal is electrically set free, to be deposited upon properly arranged surfaces. Electroplating and electrotyping are operations of this kind. In the electric furnace, however, the electricity acts as a source of heat, and the latter is the effective decomposing agent. In manufacturing chemical preparations many electrolytic processes are now employed. In liquids which do not conduct a current electrolysis does not take place.

Suppose, now, we employ several precisely similar currents to effect a variety of elec-

trolytic changes. Let one current liberate hydrogen from water, another deposit silver, another copper, and so on. Then, upon measuring the quantities of the different substances which have been set free, we shall find them to be exactly proportional to their *chemical equivalents*, an equivalent being the ratio between the atomic weight of an element and its valency. For univalent elements the atomic weights and equivalents are identical, for bivalent elements the equivalent is half the atomic weight, and so on through the list. If, then, one gram of hydrogen is liberated, the same current in the same time will deposit 107.11 grams of univalent silver, or one half of 63.1 grams of bivalent copper, etc. This fundamental proposition of electrolysis is known as Faraday's law. Furthermore, the separated ions all carry equal electrical charges per unit of valency, 96,500 coulombs for a univalent ion, and twice that for a bivalent ion. The relation between electrical and chemical phenomena is of the very closest kind, and Faraday's law is absolutely general.

When two or more substances act upon one another chemically, the entire process is termed a *reaction*. Very many of the reactions which are observed in the laboratory take place between bodies in solution, and hence the study of solutions has received and is still receiving a great deal of attention. No complete theory of solutions has so far been developed; why one substance should dissolve easily in water, another slightly, and a third not at all, remains unexplained; but some generalizations have been reached, and these are of the most suggestive character. Some of the phenomena are electrolytic in their nature, and others go to prove a remarkable parallelism between bodies in solution and bodies in the gaseous condition.

In Avogadro's law the volume of a gas is defined by conditions of temperature and pressure, and equal numbers of molecules occupy equal spaces. The power of exerting pressure is one of the distinct properties possessed by all gases, and this is a consequence of the fact that the molecules are in rapid and continuous motion. Substances in solution are also found to exert pressure, and the latter can be measured by various means. The pressure is proportional to the strength of the solution, and although it is not easily detected, it is often very great. The movement of the sap in a plant is due to the *osmotic pressure* of the dissolved substances that it contains. In 1887 Van t'Hoff, studying these phenomena, deduced from them the simple law that equal volumes of solutions, at equal osmotic pressures, contain equal numbers of molecules, and Avogadro's law was directly paralleled. A body in solution and a gas obey precisely similar laws. We have already seen that from the actual weight of a gas its molecular weight can be determined. Now, from the behavior of substances in solution their molecular weights can also be ascertained. A saline solution does not freeze so easily as pure water, and its boiling point is higher; the depression in one case and the elevation in the other being proportional to the molecular weight of the dissolved substance. These facts are directly connected with Van t'Hoff's generalization, and they are now of almost daily application in scientific research. The actual measurement of

CHEMISTRY

molecular weights has been enormously extended by means of the new laws.

Both gases and solutions, however, sometimes exhibit apparent anomalies. Certain compounds, when vaporized, seem not to agree with Avogadro's law, and such facts require explanation. The seemingly anomalous substances, as such, do not exist in the state of vapor, but are split up, or *dissociated*, into other things. For example, ammonium chloride, NH_4Cl , above a certain temperature, is decomposed into a mixture of two gases, hydrochloric acid and ammonia, $\text{NH}_3 + \text{HCl}$, which, on cooling, reunite and reproduce the original compound. Twice as much vapor as is required by theory, and specifically half as heavy, is produced by this transformation, which is but one of a large class, all well understood.

In the case of solutions it was found that many compounds, especially the acids, bases, and metallic salts, caused a lowering of the freezing point that was twice as great as should be expected. Here again a splitting up of molecules, a true dissociation, exactly like that observed in gases, had occurred. Furthermore, the anomalous compounds were all electrolytes; that is, their solutions conducted electricity and were electrolytically decomposed; while normal substances, like sugar, were not. Solutions, then, were to be divided into two classes, differing electrically, and also dissimilar in their relations to Van t'Hoff's law. The explanation of these differences is given by Arrhenius in his theory of *electrolytic dissociation*.

As interpreted by this theory, an electrolyte, when dissolved, is dissociated into its *ions*, partially in a strong solution, and entirely in one which is infinitely dilute; a statement which leads to some remarkable conclusions. For instance, the ions of common salt, sodium chloride, are atoms of sodium and chlorine. In a dilute solution the salt itself ceases to exist as such, while atoms of sodium and of chlorine wander about, chemically separated, but still in equilibrium with each other. Sodium sulphate may be regarded as made up of two parts, sodium ions and ions of an acid radicle, SO_4 , and these are severed apart during solution to move about independently. According to this view electrolysis is not primarily a decomposition of the salt: it is rather a sorting out of the already uncombined ions, which receive different electrical charges and concentrate separately at the two electrical poles. Some ions are single atoms, others are more or less complicated groups such as CO_3 , SO_4 , NO_3 , PO_4 , etc., which cannot be, or at least have not been, independently isolated.

In the study of chemical reactions the ionic theory of Arrhenius has been fruitfully applied. By means of it we are now able to better discriminate between acids and bases, and to interpret more rationally the phenomena of neutralization. Acids are all characterized by the presence in their solutions of hydrogen ions, single atoms with a univalent radicle two atoms for each bivalent radicle, etc. Thus in hydrochloric acid the ions are H and Cl; in sulphuric acid 2H and SO_4 , and in phosphoric acid 3H and PO_4 . In bases, on the other hand, ions of *hydroxyl* exist, and this is a radicle of the formula HO, in which the bivalent oxygen is only half combined. Caustic soda, NaOH, for ex-

ample, dissociates in solution into the ions Na and HO; caustic lime, CaO_2H_2 , into Ca and 2HO , and so on. When a dissolved base and a dissolved acid are brought together, the H ions of the latter and the HO ions of the former combine to form water, H_2O , and vanish from the reaction. The salt which is produced is represented by the remaining ions, and as the characteristic features of acid and base are gone, the result is neutral. Nearly all reactions in solution, but not quite all, are reactions between ions rather than between the actual compounds with which we originally began.

In the time of Lavoisier chemistry was hardly more than a minor subdivision of natural philosophy. It was just coming into recognition as a true science, and its votaries were few. Its great development has taken place in little more than a century, and now it touches many other branches of knowledge, affects all departments of industry, and gives employment to tens of thousands of men. In every part of it there is intense activity, and discovery follows discovery faster than they can be assimilated. Mineralogy is to all intents and purposes a branch of chemistry, for minerals are classified upon the basis of their chemical composition, and the first step toward the establishment of a new species is its chemical analysis. Physiology is in great part a chemical science; respiration, assimilation, and excretion are chemical processes; within the living organism, plant or animal, substances are undergoing transformations which only the chemist can follow or identify. The chemistry of vital processes, *biochemistry*, is almost a science by itself, so large is its field and so varied are the problems with which it has to deal. Medicine is indebted to chemistry for almost a new pharmacopœia, for not only have new remedies been created, but in place of old drugs, crude and bulky, the compact and more elegant active principles are now employed. Anæsthetics, such as ether, chloroform, and nitrous oxide; hypnotics like chloral; the remedies derived from coal-tar; and alkaloids like quinine, morphine, and cocaine, are a few of the contributions with which chemistry has enriched medical practice. Even antiseptic surgery depends upon chemical preparations for its success.

The chemistry of agriculture is separately treated elsewhere, but a word may fairly be said upon the relations between chemical science and the arts. Every manufacturing industry is directly and profoundly affected by the results of chemical research. A century ago probably no manufacturing establishment in the world even thought of maintaining a chemical laboratory; to-day hundreds are in operation for the benefit of the intelligent manufacturer. Coal gas is a chemical product; its by-products are ammonia and coal-tar; and from the latter, as we have already seen, hundreds of useful substances, discovered within the last half century, are prepared. Better and cheaper soap and glass owe their existence to chemical improvements in the making of alkalis; chemical bleaching has replaced the slow action of sunlight and dew; chemical dyestuffs give our modern fabrics nearly all their hues. In metallurgy every metal is extracted from its ores by methods which rest on chemical foundations, and analyses of fuel, flux, and product go side by

CHEMISTRY IN HUMAN PROGRESS

side with the smelting. The cyanide and chlorination processes for gold, the Bessemer process for steel, are good examples of the advance in chemical metallurgy; but before they can be applied the dynamite of the miner, another chemical invention, must have done its work underground. Waste products are made useful, and new applications of old materials are discovered by the chemist; even curiosities like the rare mineral monazite are brought into play. Monazite furnishes the oxides of thorium and cerium, from which the mantles of the Welsbach burners are made. Every year brings its improvements, and chemical patents by the hundred are annually issued to inventors.

The facilities for chemical training have increased side by side with the demand for chemical services, and in every university or technical school chemistry has become a leading study. Even the preparatory schools are now equipped with chemical laboratories, and the science has come to be recognized as an important part of a liberal education. Apart from its practical bearings its disciplinary value is very great, and this consideration is now given due weight by teachers.

One more phase of chemical activity remains to be noticed, the organization of chemical societies. Of the larger national organizations the English society is the oldest, the French next, then comes the German, and then the American. The German society is the largest; but the American Chemical Society numbers over 2,200 members, and has sixteen local sections in continuous operation. In its journal it publishes over 1,500 octavo pages each year. There are also many smaller organizations devoted to chemistry, and some to special subdivisions of it, such as electrochemistry. Applied science is represented by the Society for Chemical Industry, an Anglo-American association of great strength.

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Chemistry in Human Progress. Running over some of the great chemical developments to find a starting point, agriculture appears to be a good field to begin in. As agriculture is the oldest industry on the face of the earth, it is not strange that many facts should have been discovered during the centuries of its practice. But, before chemistry was developed, there could be no science of agriculture. What was known was purely empirical, and no reason could be assigned for the result. Many may be surprised to know that scientific agriculture

dates from 1862, 39 years ago, the date of the publication of Liebig's great work on 'The Chemical Process of Vegetable Nutrition and the Laws of Agriculture.' Liebig's first work appeared in 1840, and was met with a storm of abuse and criticism. But then the world usually treats a new idea in that way. Abuse by the world often means that one has evolved an idea having some claim to originality. It seemed particularly to vex the public that a chemist should meddle with agriculture, and dare to assail the views of practical farmers. The book went through many editions and then dropped out of notice, for, although founded on correct principles, Liebig had erred in his inferences, and his ideas when put into practice failed entirely. Liebig stated that the plant lived on, or assimilated, the simple or inorganic constituents of the soil and converted them into complicated organic substances such as cellulose, sugar, albumen, etc., and that the animals lived on the plant; that the plant built up complicated substances out of simple ones, and that the animal consumed these complex substances, and then converted them back into simple substances. In other words, the plant was a synthetic organism, and the animal an analytic. To establish this, and to found upon it a practical method of agriculture and physiology, was a work so colossal that it is no wonder that even the mighty intellect of Liebig should have failed at first to grasp all of the details. Liebig examined an immense number of plants from all parts of the world, and found that while the plants all contained the same ash constituents, different kinds contained different proportions of these mineral ingredients; even different parts of the same plant, as the leaves, the stalks or the seeds, contained varying relations of ash constituents. As a result, Liebig was able to state that every plant takes from the soil a certain amount of mineral substances as a definite mixture, and that these substances will be found again in the ash, and that the carbonic acid and ammonia which the plant requires to form its combustible parts are taken up through its leaves and roots from the atmosphere. If wheat, or corn, is grown on a field, year after year, in time the mineral food of the soil will become exhausted and the plants will not thrive, but will be dwarfed and puny and incapable of enduring the weather, or will die of starvation. Now, if the proper amount of mineral nutriment be added to the soil, the plants will grow, and the atmosphere and mechanical nature of the soil will look after the rest.

A factory was established to manufacture artificial fertilizers according to Liebig's idea, but after several years of trial it was found that they were a complete failure. Liebig knew that his theory was right, but was unable to explain why it failed in practice. He worked and thought, and thought and worked. After several years he noticed that certain fields which he had treated with his fertilizers, and which had not been bettered by them, began to show slight but marked and increasing signs of fertility. In the meantime, the English farmer, Lawes, working with a chemist named Gilbert, showed that fertilizers would produce effects if added in a soluble form, and further that ammonia and forms of nitrogen were not taken

CHEMISTRY IN HUMAN PROGRESS

up by the plants from the air alone, but that they must be added to the soil. If these conditions were followed, the yield of a field was enormously increased. Liebig had supposed that if his fertilizers were easily soluble in water they would soak through the earth before the plant could assimilate them, and had hence made them as difficultly soluble in water as he could. But Thompson and Way long ago proved that surface soil had the power to retain certain substances when in solution. The scales fell from Liebig's eyes. The mineral food of the plant must be placed on the soil in soluble form; the soil would hold it and the roots would absorb it. In 1862 appeared the new edition of his great work, and agriculture became a science. It was easy to find out what was the proper food of any plant, and no farm need suffer from exhaustion. Since then the progress in this branch of science has been so rapid that it is hard to follow it. The striking facts of this discovery have been merely touched upon; there are many minor ones, and the conditions necessary for the successful application of the results are numerous, but every day shows advance in our ability to understand and apply them.

What are the effects of this discovery upon civilization? We find that agriculture as a livelihood, indeed, as a profession, has enormously increased. The vast deposits of fossil bones, phosphate rock, and of guano have been opened, and have developed a great industry, as well as have increased the resources of the world many fold. Stations have been established in many places for the examination of fertilizers and the determination of their value by chemical analysis, and employ a small army of trained chemists. The education and protection of the farmer have become a matter of national importance. Instead of farming land until it is used up, or relying on an empirical rotation of crops, the nutrients taken from the soil are systematically put back. Careful study of the chemical composition of a plant and the effect of chemical fertilizers enable us to develop certain products formed by the plant. Thus the beet root, by careful treatment, has been compelled to produce a far greater amount of sugar than formerly, and Germany has been freed from her dependence on other countries for her supply of sugar. Certain substances have been found to increase the specific functions of a plant, and so a plant can be developed into leaves, roots, stalk, or seed. In fact, we are getting to be more and more masters of the vegetable kingdom, or in other words, we can make two or even ten spears of grass grow where there was but one, and each will be bigger than the original one.

No man who has brains and muscle, and who is not afraid of work, need ever starve in this country, where land is so plentiful. Let us note one fact here, which is often overlooked. The great wave of agricultural development has swept over the West and is rolling toward the Pacific. These pioneers skim the cream. When the soil gets exhausted they move on to new ground. This is not an entirely beneficial production. We are sending, it is true, vast amounts of grain and foodstuffs to Europe, and money is coming back, but in what proportion? The mineral ingredients of these breadstuffs

are lost to us, and soon we shall have to replace them, which will cost us more, perhaps, than we have received. In 1883 we exported:

Of wheat.....	\$120,000,000
Of corn.....	28,700,000
In all.....	\$148,700,000

The cost of production of this was \$60,400,000, so that one might think that there was a profit of \$88,300,000.

According to Prof. Voorhees, of the New Jersey Experiment Station, however, there were in this exported wheat and corn 70,000 tons of nitrogen, 40,000 tons of phosphoric acid, and 21,000 tons of potash, which are worth, at market rates, \$33,000,000. Hence our real profit is only \$55,300,000, and a corresponding decrease in the capital stock of the West. This amount in time must be replaced, or our soil will become exhausted. So long as we can draw on our native supplies, well and good, but the time may come when we may have to buy them back, and at an advanced price.

In a word, then, Liebig's great discovery has done much to develop the prosperity and independence of nations, for the independence of a nation will be based largely on how well it can feed its inhabitants, that is, its power of endurance. No better result of the wonders that scientific agriculture can accomplish may be seen than in the States of Connecticut and New Jersey. Look at the thousands of acres reclaimed from stone and sterility and now yielding bountiful crops under scientific treatment. Nor forget what honor is due to the men who, by dint of sheer persistence, grit and brains, introduced Liebig's work into this country, and who have educated the plain agricultural workers to such an extent that these States can compete with others better adapted by nature for agricultural production, who established the first agricultural stations, after which all of our others have been modeled, and to whom not only these States but our whole country owes a debt of millions of dollars, if prosperity can be repaid in cash. I mean Prof. Samuel W. Johnson, of New Haven, and Prof. George H. Cook, of New Brunswick.

Let us now look into the subject of livestock and see what chemistry has done there. Lavoisier had shown that animal warmth was due to processes of oxidation, a kind of burning of the carbonaceous and hydrogenous substances in the body, just as the heat of burning wood is caused by the oxidation of the carbon, its chemical union with oxygen. Dulong and Despretz proved that nine tenths of the heat produced in the body was owing to this cause. The heat of our bodies appears to be a kind of flameless fire. Bodily heat is very much like steam heat, and to produce it fuel must be constantly kept burning under what may be termed the boilers of our organisms.

In the subject of animal nutrition the mighty mind of Liebig again found a vast field to till. In many ways this was no new and untrodden ground. Physiologists had accumulated hundreds of interesting facts, but the great question, how is it that although the nutrition of the various animals is so different, the composition of their bodies is so nearly the same, had not been answered. The flesh of the ox, the bird, and the man is about the same thing. The

CHEMISTRY IN HUMAN PROGRESS

change of substance in a hungry herbivorous animal is about the same as in a carnivorous one. From the day of Hippocrates to 1840, this question had been becoming more clearly defined, but the answers to it were conflicting and unsatisfactory. Suddenly, like a flash of lightning, the darkness was dispelled. The essential facts had all been found, but a chemist was needed to translate and explain them. It was like the old story of the writing on the wall. It was there, but no one could read it. It would take me too far from my subject to attempt to explain the details of Liebig's views of physiological chemistry, to relate the fierce polemic wars waged on these questions; for the dictum of Ranke is as true in the history of science as in the history of nations: "All progress is through conflict." Suffice it to say that Liebig was the first to definitely assert that the animal must find the chief constituents of its blood, which form and nourish its whole body, ready formed in its food, and these substances originate and are found in the plants. Following this up, we find that the animal is a kind of chemical factory in which many chemical processes are carried out. The machinery belongs to physiology; the processes, however, are largely chemical.

Chemical statistics in relation to animal life were collated and increased. Animals were analyzed wholesale, and their chemical composition determined. For instance, Lawes and Gilbert found that the analysis of 348 whole sheep gave an average of 2.34 per cent of ash, 7.13 per cent of protein, 70.4 per cent of fat, and 20.1 per cent of water. All kinds of animals were examined, and the composition of entire specimens and of the various organs and fluids determined. Foods were examined chemically, and, in fact, not only the body of the animal, but all that went into it and came out of it was analyzed by the chemists. The result of all this was that chemists found the animal to be as susceptible of experiment as the plant. Live stock can now be fed, for instance, to make flesh, to make fat, to yield milk, to produce work, or to simply maintain life. The nutritive elements of food can be determined and their digestibility estimated. The economy of foods can be calculated, and, in fact, the whole subject of animal-raising has passed from empirical management to scientific organization, and in this field, too, the progress has been rapid, and is still wonderfully rapid.

The animal is now studied very much like a steam engine; in the one case we feed coal and get steam, power, or heat, in the other, we feed fodder and get milk, flesh, or power, as the case may be. A "ration" can now be made in which the digestible proteins, the fat and carbohydrates can be obtained from the most various sources, and the fluctuations of the markets taken advantage of to produce the raw materials. The nutritive value and digestibility are carefully adjusted, and, as a result, for instance, we are able to produce milk at a total expense of 2½ cents a quart. In this country the science of live-stock feeding is as yet in its infancy. We are, at least in the West, gathering the bloom of the land. Our cheap beef and our cheap corn can be produced only for a time. Sooner or later the riches taken from the soil must be put back again. It would be hard, indeed, to trace all the effects of these discov-

eries on the gradual progress of civilization. Cheaper food and more economical and profitable agriculture strengthen the great tap-root of all civilization and human relations on this earth.

As a result of all this great advance in our knowledge of scientific agriculture farming has become a profitable profession, and I predict that more and more we shall see educated young men entering it.

The chemical study of foods has been carried up to the feeding of men. Prof. Atwater, of Wesleyan College, has published the results of his investigation on the cost of supporting workmen, and finds that the amount of food necessary to support a man and enable him to do his daily work, can be obtained at a cost of 12 cents a day. For 45 cents a man can live sumptuously. When meals are provided for a number at once the cost is ridiculously small. It might be well for some of the knights of labor and serfs of capital to look into these matters. What a frightful waste there must be in our household economy of to-day.

What a future looms up in this field of study. Think of the suffering and want that this accurate chemical work will alleviate when it is understood and appreciated. The German government supplies the people in certain districts with plainly written tracts explaining what are the most valuable nutriments in foods and about what amount of each is needed to make a daily ration which shall neither want nor waste valuable substance. Our own government is doing the same. Chemical knowledge gives an enormous increase in the purchasing power of a country, and greatly ameliorates the environment by making it more favorable to the people.

In the days of old, people supposed that every object was a particular kind of matter. It is true that Aristotle believed in four elements, earth, air, fire, and water, but these were used largely in a figurative sense. Wood was a substance, so was coal, so was water, so was air. They were supposed to be different kinds of matter. As chemistry began to develop, during the last 100 years, it was found that all the different kinds of matter about us could be resolved into a certain number of simpler substances, and that these simple substances could not be further altered. They were hence called elements. So far, about 75 of these elements have been found. All of the material objects about us are compounds of these elements; some, of course, being very common, and others more or less rare. Oxygen, for instance, a colorless gas, but when in combination, giving rise to compounds of the most various properties, constituting one half of the earth's crust, nearly one quarter of the air, and about one half of clay, sand and limestone. At first, methods of ascertaining the percentage composition of substances were very crude, but during the last 50 years they have, by means of the exquisite delicacy of the chemical balance and our increased knowledge of the chemical behavior of substances, been brought to a very satisfactory state of exactness. A student can now analyze with ease substances that would have perplexed the professor of 50 years ago. Aside from the immense advance in our knowledge of chemical causes and effects made by this powerful lever placed at our disposal, the public has been afforded a most marked protection

CHEMISTRY IN HUMAN PROGRESS

against fraud and imposition. No matter how high-sounding and laudatory the announcement of certain articles may appear, the cold-blooded analysis of the chemist at once dispels the illusion. There is no lack of unscrupulous persons who take advantage of many a chemical discovery to fill their own pockets at the expense of the public. The extent to which adulteration is carried to-day cannot be conceived of by one who is not conversant with the results of the analysis of commercial articles. Indeed, the popular ignorance on this subject is astounding. The continual demand by the public for cheap articles drives the manufacturers to all sorts of ways and means to adulterate. To counteract this, boards of health are continually analyzing articles of food. But commercial articles, however, are, as a rule, examined only by those who know how a chemical analysis can protect the buyer. Some years ago New York paid \$10,000 a day for the water added to the milk sold in that city. In every city one will find many articles of daily use are systematically adulterated. The time will come when every city will have to have its board of public analysts, who shall analyze all articles free of charge. Such boards now exist in France and Germany, and the results of their work throws a sombre light on the strivings of human cupidity. Cream of tartar often contains as high as 80 per cent of adulteration, illuminating oils are not seldom about as safe as gunpowder, soaps may be one-half water, borax is sometimes mostly baking soda. In the matter of fertilizers, the State experiment stations examine free of charge all articles, and determine their true value, but hundreds of other articles should also be tested by the government that the public may be protected. Slowly but surely the keen weapon of chemical analysis is lopping off all these unsightly side-shoots of our civilization. As long as food and drink consist of chemical substances and so many of the articles bought and sold are chemical compounds, it should be known to what extent they are what they are claimed to be.

What is the effect of the increasing accuracy in chemical analysis upon our civilization? It places every article on its true basis of intrinsic worth. Metals, ores and articles of commerce, have a certain value depending on the nature and amount of their valuable constituents. This is determined by analysis, and business is at once placed upon a solid foundation, and insecurity in values ceases. Chemical analysis is the balance wheel of trade. It establishes responsibility. It says to the cheat, honored and respected though he may be in the community—and there are thousands of them—“Thou art the man.” It compels accuracy of statement—rigid truth. There is no effervescent sentiment in a chemical analysis. It makes honesty compulsory. Articles of food and drink must be what they claim to be, no more, or less. A man who adulterates is a liar and a thief, if not also a coward. He may cause ruin, disaster and death. A man who buys adulterated articles is a fool. Chemical analysis is one of the greatest agents for the protection of a community that there is, and its power is increasing every day. Again note: Chemical analysis shows clearly which of several articles are the best. Then we buy the article that we know to be the best. And so chemical analysis, disclos-

ing to the world where true worth is to be found, develops countries and gives them resources which may enable them to compete with greater nations. It shows us the relations between the material objects about us, and our own relations to them. For instance, the atmosphere, which is necessary to our existence, is composed of oxygen and nitrogen. The oxygen is being continually consumed and appears again as carbonic acid, the results of fires, fermentation and the respiration of animals. The plants consume the carbonic acid and give back the oxygen again to a great extent. There are thousands of these agents at work to change the composition of the air. And yet its composition does not practically vary. Should it, however, then life would feel the change at once. An increase of the percentage of oxygen in the air we breathe would produce a marked effect upon us. It is wonderful that the balance of these conditions is kept in such equilibrium on such a scale.

And still again, chemical analysis showing how all the objects about us are composed of but a few different kinds of matter, how, indeed, we ourselves consist of little more than a dozen elementary forms of matter, compels us to gape in bewilderment at the evolution of a universe, with its endless variety of detail, out of less than a hundred different kinds of matter.

For a number of years chemists have been laboring to produce substances and study their properties. In this way a vast number of compounds have been produced, and the list is now yearly added to at a rate that makes one's head ache. The chemist interests himself chiefly with their chemical and physical properties, and as to their proper position in the particular classes to which they belong. Thousands and thousands of such substances have been created, or discovered, by the chemist, and but a very small number of them have as yet been applied. The study of their physiological properties will afford work for a legion of physiologists. Take ether and chloroform as instances. How hard it is to imagine a time when anæsthesia was unknown. Think of being unable to overcome pain! Of course the introduction of these agents met with opposition. Some said it was wrong to prevent pain, as others thought it a sin to use an umbrella because the rain was intended to wet us, or to insure one's life because it was flying in the face of Providence. But in time the clouds of ignorance were dispelled and the world came to know one of the greatest blessings that science has bestowed upon humanity. The pain and suffering that these agents have saved humanity is incalculable. Operations, which years ago would have been regarded as madness, are now, by their use, of common occurrence. There are thousands of substances whose physiological properties have not yet been tested. It may be that among all these substances we may find ones that will directly affect each function and organ in our bodies. Physicians have as yet but barely entered this field of physiological research; and unfortunately their labors are hampered in certain places by the attacks of the so-called Bestarians, who would not permit vivisection. Strange how little compunction these people seem to feel in allowing the results obtained by vivisection to be applied in the treatment of their own families when sick. The law of

CHEMISTRY IN HUMAN PROGRESS

atonement is nowhere more strikingly exhibited than in scientific research. If certain diseases are to be controlled, their causes discovered, and stamped out, cats and dogs may have to be sacrificed. We may wish all of our friends, all the babies and all of the cats and dogs to live, but like many other things we would like to have, we may have to suffer disappointment. Perhaps, after all, the fair sex is responsible to some extent for the destruction of animals. Think of what an indiscriminate slaughter of birds is continually going on that our fair friends may be able to carry fragments of the remains on their heads. Even if the tortures ascribed to vivisection existed, they would pale beside the horrors that follow the sportsman. The animals and birds dying in fevered agony of peritonitis and being eaten alive by ants and beetles are fully as heart rending as anything that has been ascribed to vivisection by the wildest imagination.

Look at the advance in our knowledge of the action of disinfectants. And here again, but an absurdly small number of the vast array of substances at our disposal have been tried. Many diseases are communicated by a kind of seeds, spores, or germs. If these seeds can be killed it is impossible for the disease to get a foothold. Just as when the seeds of a plant are killed they will not sprout. The following instance of what can be done in this direction is interesting.

Some years ago the whole city of Detroit was disinfected by Dr. Oscar W. Wight, health officer of that city. All the receiving basins, sewers, etc., were disinfected by copperas, and the atmosphere of the sewers was purified by hanging in the manholes iron pails filled with burning sulphur. In all, the amount of copperas used by officials and citizens was 280,000 pounds. The gaseous disinfection of the sewers requires about three tons of roll brimstone. The total expense for the complete disinfection of the sewers (75,000 pounds of copperas and 6,000 pounds of sulphur); was less than \$1,300.

After the first disinfection of the city, there followed a great abatement of diphtheria, and an almost entire cessation of scarlet fever. The second experiment was followed by an almost complete cessation of diphtheria. Some years ago I kept the gutters of New Brunswick, N. J., disinfected with a solution of bromine, and obtained a marked improvement in them. These facts make one stop and ponder. If, then, instead of spending the money of a community in supporting inefficient officials, ward heelers and political quacks, a portion of it were expended in the systematic purification of the town, the death rate would be decreased; there would be fewer little graves to dig. But think of the astonishment of even a not unusually common council if asked to appropriate, several times a year, a sum of money to buy materials to throw into the sewers. Diphtheria, scarlet fever, and, for all we know, many other diseases, are the punishment of infractions of laws ordained for our benefit. Official cupidity, negligence and ignorance mean more than bankrupt towns, business depression, and loss of confidence. They mean broken hearts and bleak graves. The money received from political deals, or from the sale of a vote, is but poor recompense for the loss of a child. The increase in personal responsibility caused by the increase

in scientific knowledge is a vast one. It will be the great lever of the future.

The time is fast coming when the good old-fashioned phrase "dispensation of Providence," as so often used, will have to be replaced by the more easily understood but less pleasant, although entirely synonymous words, "the effect of ignorance," or "the punishment of incapacity," or again "the result of neglect," or yet again, "the spew of dishonesty." In fact, the object lessons of nature are so plain that a philosopher might think them to have been especially designed for the intelligence of an average politician. Take, for instance, the cases at Plymouth. The discharges of a typhoid patient were thrown into a brook, and the brook ran into the reservoir of the town. Soon there were 2,000 cases of typhoid. About the same thing occurred in the village of Lausanne, Switzerland. Such are the object lessons of nature.

As chemical knowledge advances and chemists analyze minerals and the substances found in plants and animals, determining their relations and properties, classification of many compounds becomes possible. Many substances, exclusive of those found in animals, have been produced by the chemist. Thus ordinary salt is the same substance, whether extracted from seawater or produced by mixing muriatic acid and soda. But the substances found in animals, that is in organized objects, while they were analyzed and their composition accurately determined, were supposed to owe their formation to the action of some mysterious vital power, usually called "vital force." It was assumed, with really no other apparent reason than it had not yet been done, that it could not be possible to make an organic substance artificially. The animal by reason of its mysterious, inherent vital forces must do that.

There is a certain compound called urea which is formed in the animal system, and which in many ways is of extreme importance. It was described in 1773 by Rouelle, and determined in 1790 by Fourcroy and Vauquelin. In every way it was then considered as an organic substance par excellence. In 1828 the great master, Woehler, of Göttingen, made urea artificially by heating ammonium cyanate, and the vast field of organic chemistry was opened to investigators. In 1832 Liebig and Woehler published the results of their labors on benzoic acid and the oil of bitter almonds, letting in a flood of light upon the subject of chemical constitution. The great Berzelius in his excitement proposes to call the new radical "pröin," from *Proi*, the beginning of the day. Since this time, the truly marvelous structure of organic chemistry has grown at a rate unequalled in the history of the development of any science. I wish there were some way of explaining organic chemistry to the general reader, for it is a wonderfully interesting subject. We can appreciate its results although unable in all cases to follow the methods by which they are obtained.

There have been so many remarkable victories achieved in the field of organic chemistry that it is hard to decide which to mention. Prominent among them are aniline colors. A more uninviting substance than coal-tar is not often found, yet in the hands of the chemist it has yielded compounds which, by profound study and skilful manipulation, supply the world with colors surpassing in beauty anything

CHEMISTRY IN HUMAN PROGRESS

produced by nature. In a few years a great industry has sprung up, employing thousands of men and an enormous capital; and all this founded on a waste product which manufacturers were once at their wits' end to find means to dispose of.

And, then, to what an extent is the fair sex indebted to the humble chemist! We have given them the wonderful aniline colors, which would put Solomon in all his glory to shame, and compel the peacock to hide his head and his tail in bedazzled desuetude. We can make velvet out of cotton and sealskin out of silk. We can supply perfumes surpassing the distilled refinements of the spices of Araby. We can make artificial blushes, heart palpitations, inflated rubber bosoms, and alabaster complexions. We can make imitation feathers, or whole birds if necessary, as well as all kinds of floral and animal remnants for personal decoration. We can change raven locks to tresses of glinting gold, or *vice versa*. We can supply eyes of any shade of color, as well as any number or kind of teeth. In fact the chemist is to the girl of the epoch what the lamp was to Aladdin — only more so.

Indeed, many of our so-called necessities of life are of quite recent introduction. Sugar, for instance, as late as 150 A.D. was prescribed by Galen as a medicine, and in 1455 was still a rarity. In 1775 all England consumed only 20,000,000 pounds in the course of the year against 20,000,000 hundred weight in 1885. And now comes the new sweet substance, saccharine, which is so sweet that a pinch of it will sweeten a barrel of water.

It is strange to note what a power may be exerted by a chemist working in some small and but little known laboratory. Graebe and Liebermann undertook the study of alizarine, the coloring matter of madder, and soon found out its chemical nature, and were able to produce it artificially from a substance found in coal-tar. A manufacture was founded and madder growing is slowly but surely dying out. Lately Baeyer has untangled the complications of indigo blue, and it is now but a matter of time when indigo growing will cease to be an industry. Salicylic acid, formerly a rare and costly product, has become an article of commerce, through the labors of Kolbe, who showed how it could be made cheaply from carbolic acid. And now a nation can send its armies out to battle in a region where rheumatic complaints would cripple them and leave them helpless at the mercy of their foes, had they not this power at their control to subdue these diseases. It is true, the diplomat utilizes to their full worth the powers at his disposal, but it must not be overlooked that the chemist furnishes him with many of his most efficacious agents.

I could go on with a long list of triumphs in organic chemistry and show how much we are indebted to the labors of certain diligent investigators in this field. In the matter of the processes of digestion our knowledge of organic chemistry has enabled us to make important progress in the last years. We are now able to produce many new and valuable forms of food, especially for children and invalids. Thousands of lives are saved every day by the use of chemical foods, and the application of chemical discoveries.

Let us glance for a moment at iron and steel. If iron contains even very small amounts

of certain substances, as phosphorus, for instance, it has but little value, for its properties are injured. Within a few years a young English chemist after patient experiments discovered a method by which the phosphorus could be easily removed from iron. This appears to be a simple matter, yet how much it means. Immense deposits of iron ore which could not be used because they contained phosphorus became at once of value. The material wealth of the country was immensely increased. The uses of iron and the simplicity of its production were increased. It has been well said that this untitled, almost unknown young man (Walter Weldon, q.v.), has done as much or more for England than all her kings, queens, and aristocracy put together have accomplished for her.

And again, now that we are coming to live in an age of steel, note that steel is a chemical industry. To make steel, we must decarbonize iron to a certain point, and to do this economically Bessemer introduced a method which revolutionized the whole industry. Can any one tell what the debt of the world is to cheap steel? Any one who will bear it in mind will find himself giving hundreds of answers to it. Try to trace out for how many of what are called the necessities of daily life we are indebted to cheap steel, and one cannot but be surprised.

The subject of the metals in general is worth attention. Chemistry has brought our means of extracting them from their ores and their subsequent refinement to a remarkable degree of perfection. We have numerous alloys which are of daily service, as phosphorus-bronze, friction-metal, gun-metal, and a thousand other useful inventions, all tending to cheapen articles and, indeed, in many cases to beautify common objects. Compare the doorknobs and hinges tastefully made of bronze with the common ones in use only 20 years ago. This all means the art education of the people, and we must never underestimate the power of this. And now we have cheap aluminum. It looks as if this may be the metal of the future. Brilliant, wonderful in its many properties, and more remarkable still in the fact that every clay-bed is a mine of it. How irritating this has been to chemists for years can well be imagined. Incalculable stores of this beautiful metal all about us and no means to extract it. If aluminum can be modified as iron now is, and given the properties akin to wrought iron and steel, then the future will be the age of aluminum.

If one were to ask how the state of civilization of a country should be judged one would probably be told how many churches there were, attention would be drawn to the volume of business done, the fine hospitals, the excellence of the police, the commodious jail, the tax rate and many other prominent features of the place. The chemist, however, would simply determine the amount of sulphuric acid used, directly or indirectly. In other words, almost all of the articles we use involve either directly or indirectly in their manufacture the use of sulphuric acid. This manufacture is carried on a scale so vast that a fair idea can hardly be given of it. Every detail has been studied and studied by scores of chemists. Each reduction in the cost of making it has cheapened thousands of articles. In the manufacture of bleaching powder

CHEMISTRY IN HUMAN PROGRESS

there was once a great waste. The acute mind of Walter Weldon turned this loss into a source of profit and the price of chloride of lime was reduced. Every time that we buy a piece of white paper and admire its whiteness and cheapness, we must remember that we are indebted to Walter Weldon.

Indeed, in the matter of paper, note how striking has been the progress. Cheap paper means cheap books, cheap newspapers, cheap knowledge, education of the public. Good paper means preserved eyesight. I need not say that paper is really a chemical manufacture. But little progress would be made in turning wood into paper without the chemist. And note again the future of paper. We have paper car wheels, paper gas pipes, paper water pipes, paper pails, paper stoves, paper chimneys, paper boats, paper forts, etc., etc.

One of the very important results of the study of chemistry has been the gradual change of empirical and wasteful processes of manufacture into rational and profitable methods. Every year shows progress in increasing the yields of manufactured products, and also increase in purity. Wastes are utilized, manufacturing costs are decreased, labor is made more efficient, trade expands and profits increase.

In 1739 Dr. Clayton, dean of Kildare, first distilled coal. But it was the end of the century before gas was practically introduced as an illuminating agent. Imagine one's sensation on first being asked to put a network of piping into one's house to convey a combustible and poisonous gas. The joints might not be tight, the cocks might leak; we might be poisoned by the thoughtlessness of any one who might not shut them off, or, indeed, the house might be blown to bits should the gas escape and ignite after it had become mixed with air. Yet it does not worry us now, even though all these things do come to pass not infrequently. From Dr. Clayton's experiments has arisen a vast industry with complicated side branches. Gas, coke, colors, medicines, disinfectants, delicate flavoring essences and a host of other inventions have followed in a steady stream. There has been no end to the discoveries in this field. In Europe gas has become almost a waste product, so valuable have its by-products become.

The invention of artificial light has extended the available term of man's life; by giving the night to his use it has, by the social intercourse it encourages, polished his manners and refined his tastes, perhaps as much as anything has aided in his intellectual progress.

It is very interesting to trace the development of many manufactures, as for instance the introduction and perfection of glass-making, which allows us to avail ourselves of the best medicine there is, sunshine. What a world of happiness lies in that word "sunshine!" Disease germs are paralyzed by it. Plenty of it prevents dark deeds. If we ever feel like being thankful, let us remember the abundance of windows in our houses, and that our little ones can play in the sunshine, and that we can have sunshine in our houses free of cost and without tax. How little one realizes the convenience in the use of glass and china articles. That hard, smooth surface which can be so readily cleansed, and which makes our tables so attractive and our food so palatable. We shall find that much of our pleasure, and, indeed, a good deal of our

health, is dependent on glass and porcelain. The chemist has done hard work for us on these articles, for there have been many neat chemical problems involved. We can now give glass some valuable properties. We make wool of it, spin it into yarn and weave wonderful dresses of it; make wigs of it, cover steam pipes and fill floors with it, make railroad sleepers out of it. Perhaps, in time, we shall be able to turn it on a lathe, or even to live in a glass house without fear. Who knows? Does not the illustrious Hofmann say, "With the gods and the chemist all things are possible"?

There are many interesting applications of chemistry which have been forceful factors in the development of civilization. The manufacture of soap, for instance, the use of which has also been taken as an index of civilization, has been immensely improved by the labors of the chemist, and it would be easy to trace the beneficial effects of it on the health of a nation. It is true that we have not the public baths of the Romans, or places where all the poor may bathe, but we have the next best thing—cheap soap.

Then there are remarkable chemical improvements in the arts of dyeing and printing textiles, by which good clothing has been made accessible to the poorer classes. Cleanliness and good clothing are no small factors in civilization. There have been astonishing discoveries in the field of fermentation, the middle ground between biology and chemistry, from which our ideas about disease germs and ptomaine poisons have arisen, and due to which treatment of many diseases has been radically altered for the better. In fact, the whole of antiseptic surgery, which allows of operations never dreamed of in past years, has become not only possible but of daily occurrence. Thousands and thousands of useful lives have been saved by the application of these discoveries.

And so our increasing knowledge of the relations of things will enable us in time to prevent disease. The average death rate in our cities is far too high. The average duration of life is about ten years too short. There are over 100,000 unnecessary deaths every year in the United States. In time we shall see more of true death, Euthanasia, or old age. How well Richardson describes this: "Without pain, anger, or sorrow, the intellectual faculties of the fated man lose their brightness. Ambition ceases or sinks into desire for repose; ideas of time, of space, of duty, languidly pass away. To sleep and not to dream is the pressing, and step by step, and still pressing need, until at length it whiles nearly all the hours. The awakenings are shorter and shorter, painless, careless, happy awakenings to him of a busy world, to the merry sounds of children at play, to the sounds of voices offering aid, to the efforts of talking on simple topics and recalling events that have dwelt longest on the memory, and then again the overpowering sleep. Thus on and on, until at length the animal nature is lost; the intuitive and merely animal functions now no longer required to sustain the higher faculties, in their turn, succumb and fall into inertia. This is death by nature, and when mankind has learned the truth, when the time shall come—as come it will—that 'there shall be no more an infant of days, nor an old man who hath not filled his days.' this act of death

CHEMITYPE — CHEMNITZ

now, as a rule, so dreaded because so premature, shall, arriving only at its appointed hour, suggest no terror, inflict no agony.”

Chemistry has even dared to make the study of life a matter of investigation. Dr. Oscar Loew has indicated that in live albumen there is an atomic complex known as the aldehyde group, and in dead albumen it is not present. A striking inference of this fact is that substances which are known to have an energetic action on the aldehyde group exert also an intensely poisonous action on living protoplasm, and certain substances have on this induction been examined and really found to be violent poisons. Could we reconstruct the aldehyde group in a dead protoplasm? And if so would the protoplasm again be alive? Who can say? It is a mysterious subject and the discoveries but make it more mysterious. But then it is darkest before daybreak.

Even such a little matter as a match represents quite a number of chemical phenomena and ingenious applications of chemical discoveries. It is curious to think of what added power has been given to man by his ability to make fire so easily. The idea of fire leads me to speak of explosives, for there are some very interesting facts to be derived from the study of this subject. If we had time to investigate the effects of gunpowder in history we should note some striking results. Ancient history is largely a history of war. Disputes were settled by force of arms—physical force. Rulers ruled by force. Blood flowed on slight provocation. Might, not right, was the rule. Weapons were of the crudest kind, and wars often lasted for years. Later on the ruling classes clad themselves in armor and then as McElroy has so well explained in his article on ‘The Musket as a Social Force,’ for many years the world was at the mercy of the ‘Man on Horseback.’ He was invulnerable in his armor, and with sword and spear tyrannized, brutalized and slaughtered as his humor struck him. The serfs fared badly in the early days. In the “war of the Jacquerie,” in 1348, there was an exciting serf-hunt conducted in one of the French towns, and after three weeks over 20,000 miserable men were run to earth and killed. The man who could strike the heaviest blow was ruler in those days.

Then in the 14th century someone invented gunpowder, and then a queer sort of gun, a kind of two-inch gaspipe with a touchhole. This gun was fastened to a stick, which one man held, while a second applied the fire. The ball weighed a pound and traveled scarcely 200 feet, so weak was the powder. Crude as the whole contrivance was, and tedious as it was to fire off, it curled up the man on horseback in the dust and left him a waste product on the land. Those who had robbed the farmer of the fruits of his hard labors, now went to fertilize the crops, a most admirable adjustment of nature, even though it was somewhat belated. Soon gunpowder and the gun were improved, and by their aid the robbed man “re-clothed himself with the rights that had been torn from him by a thousand years of the despotism of the ‘Man on Horseback!’”

During the last 50 years explosives have been brought to a high state of perfection. Chemistry has placed in the hands of men agents that are so powerful that they cannot

be resisted. Trace the progress of a nation by the record of its conquests, and note how chemistry has given it, perhaps, the majority of its tools, its explosives, its system of feeding, its medicines, and so on through a long list. It will not be long before war will be impossible; in fact all conflicts impossible. The dynamite gun will blow a fort to dust, the submarine boat or the electric torpedo, guided by an unseen hand miles away, will send a ship into the clouds. The balloon, dropping explosives and inflammables, will wipe a city from the face of the earth as a child rubs a picture from the face of a slate. An explosive shell, filled with the proper chemicals, will poison a whole army. The prick of a needle, coated with virus, will sow incurable disease, and you may select from a catalogue nauseatingly long. A gill of typhoid germs dropped into the water reservoir of an ordinary town will leave few to tell of the horrors that followed. War will in time mean simply extermination of both parties. Pure arbitration, intellectual investigation of the question, the discovery of the principles and laws involved in the matter, and careful adjustment must come in time. Oppression, tyranny, and bossism are to pass away. Knowledge is the possession of humanity, not of the rich alone, or of the powerful, but it is to be the birth-right of the citizen. An irresistible power has been placed in the hands of the oppressed. First we have the slave, then the serf, now it is the wage-worker, the laborer. The capitalist has money, the laborer has dynamite. It is about as hard to know what to do with one as with the other. Neither can ever rule, and this phase, like the preceding ones, will slowly pass away. Any attempt to control others selfishly and wrongfully will be defeated by the irresistible power of knowledge of right.

Look abroad and notice how much nations take from each other without fighting. They slap each other's face and call each other bad names, but they don't fight. It is true that they support immense armies and armaments, but the time is coming when these armaments will cost so much for their support that to avoid bankruptcy they must be given up. The swords must be turned into plowshares and the men must go to work to aid in supporting instead of being supported by others. A peace of nations, a bankruptcy of nations, or an extermination of nations are the three alternatives to-day for Europe. So much Bismarck saw.

Force being neutralized, the conflict is to be one of intellect, reasoning based on an exact knowledge of facts. Physical force is already at a considerable discount. Educated brains are the important factors of success to-day.

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Chem'itype, a term used in engraving to include various relief processes by which a drawing or impression from an engraved plate may be produced in relief to fit it for printing on an ordinary printing press.

Chemnitz, kēm'nīts, or **Kemnitz**, **Martin**, German Protestant theologian: b. Treuenbrietzen, Brandenburg, 9 Nov. 1522; d. Brunswick 8 April 1586. He was the son of poor parents; received his education at Magdeburg and Frankfurt on the Oder, and in 1544, to obtain the means of continuing his studies at Wittenberg,

CHEMNITZ — CHEMUNG

became a schoolmaster in Wriezen. In 1550 he became librarian to Duke Albert of Prussia. He then wrote his 'Loci Theologici,' a valuable commentary on Melanchthon's system of dogmatics. Being invited to Brunswick, as minister, he attacked the Jesuits in his 'Theologiæ Jesuitarum Præcipua Capita' (1562), and, when the Council of Trent thought itself assailed in this work, he wrote his 'Examen Concilii Tridentini,' a work of great historical value. He gradually became attached to the Lutheran doctrines as distinguished from those of Melanchthon.

Chemnitz, Saxony, a town at the base of the Erzgebirge, and at the confluence of the Chemnitz River with three other streams, 51 miles south-southeast of Leipsic. It is the principal manufacturing town of the kingdom—the "Saxon Manchester" its townsfolk call it—its industry consisting in weaving cottons, woolens, and silks, and in printing calicoes, chiefly for German consumption. It supplies the world with cheap hosiery, and makes mixed fabrics of wool, cotton, and jute for the markets of Europe and the United States. It has several extensive machine-factories, producing locomotives and other steam-engines, with machinery for flax and wool spinning, weaving, and mining industry. Created a free imperial city as early as 1125, Chemnitz suffered much during the Thirty Years' war. Pop (1900) 206,584.

Chemnitzia, kēm-nīt'sē-a (named after Chemnitz, a distinguished conchologist of Nuremberg), a genus of gasteropodous mollusks, family *Pyramidellidæ*. The shell, which is slender, is many-whorled with a simple aperture closed by a horny subspiral operculum. The animal has a very short head, with a long proboscis. Recent species 32; fossil 240, from the Silurian Period onward.

Chemosh, kēm'mōsh, the national god of the Moabites, who were on that account called "the people of Chemosh" (Num. xxi. 29; Jer. xlvi. 46). In Judg. xi. 24 Chemosh is mentioned as the god of the Ammonites, but the whole narrative here applies to Moab, and not to Ammon. Milcom was the national deity of the Ammonites. The Moabite Stone was erected to commemorate victories achieved by the aid of Chemosh. In the inscription upon it Ashtar-Chemosh is mentioned, apparently a goddess associated with Chemosh. Human sacrifices seem to have been occasionally offered up to Chemosh (2 Kings iii. 26, 27). The worship of Chemosh was introduced among the Hebrews by Solomon, who "built an high place for Chemosh, the abomination of Moab, in the hill that is before Jerusalem" (1 Kings xi. 7). Some have identified Chemosh with the sun, others with Saturn, while still others have regarded him as a war-god.

Chemotropism, kēm-mōt'rō-pīsm, orientation (q.v.) by diffusing molecules, as where animals are attracted to their food by the sense of smell. Odoriferous particles are diffused or radiate from a centre; chemotropism is thus analogous to heliotropism (q.v.). The chemical effects of the diffusing molecules on certain elements of the skin, says Loeb, influence the tension of the muscles, just as the rays of light influence the tension of the muscles on heliotropic animals. Thus maggots of flies are positively chemotropic toward certain chemical

substances which are formed, for instance, in decaying meat and cheese. The blow-fly (q.v.) has the same positive chemotropism for these substances as its larva, and is accordingly led to the meat. This explains the instinct of the blow-fly and similar insects, which compels them to lay their eggs on the food appropriate for their young, neither experience nor will playing any part in their processes. Consult: Loeb, 'Comparative Physiology of the Brain and Comparative Psychology.'

Chemulpo, chē-mŭl'pō, Corea, a town on the western coast, 25 miles by road west-southwest of the capital, Seoul. It is one of the three treaty ports opened in 1883 to foreign commerce, the volume of which has since steadily advanced, in spite of the drawbacks resulting from the great difference between high and low water here (33 feet), and the want of wharves. The imports attain a value of \$3,500,000 in some years; the exports, \$1,500,000. The chief imports are cotton and woolen goods, railway machinery, metals, oils, and timber; the chief exports are rice, beans, millet, ginseng, and cowhides. The majority of the 3,000 foreigners are Japanese. Small steamers owned by Japanese run to Seoul in summer, and Chemulpo is connected by telegraph both with China and Japan.

Chemung, shē-mŭng', **Battle of the**, in the Revolution, 29 Aug. 1779, the decisive engagement of Sullivan's campaign (q.v.), to harry the Iroquois country. The Indians and their Tory allies made a stand in force at the Chemung River, about a mile southeast of Newtown (Elmira), N. Y. They had five companies of British troops and rangers, numbering about 250; and the entire fighting strength of the Six Nations. These Indians the Tory authorities state as 550; but this seems impossibly small, and Sullivan and his officers, from a careful estimate of various factors, place it at 1,200 or 1,300. Sullivan had about 5,000. The Indians were led by their Napoleon, Brant (Thayendanegea); the Tories by Col. John Butler, with Sir John Johnson, and perhaps Guy Johnson, Major Walter N. Butler, and Capt. MacDonald. Their line was in advance of the river, resting on a bend at the right. From the bend ran a breastwork half a mile long, flanked by bastions and having a dwelling in front turned into a blockhouse; it was concealed by a mass of pines and scrub-oaks, some of them cut from other places and stuck down to make a seemingly thick virgin forest. From their left a thin line was continued about a mile and a half to a steep ridge parallel to the river, where a strong detachment was posted; and a mile further east was another ridge parallel to the first, with a breastwork and another company, the two advance detachments designed to take the Americans in flank and rear. Along the front of the main breastwork ran the road to Newtown, exposing the whole American flank to a raking fire. The entire works formed a magnificent ambushcade; but Sullivan, who was no Braddock, guessed the utility of the ridges, and knew what scouting parties were for. About 11 A.M. of the 29th Major Poor beat up the position; and Gen. Hand formed his infantry in a wood 400 yards from the works and waited for the rest of the army. Sullivan ordered Poor to carry the hill at his right and take the British in rear, while the main body with artillery attacked the front.

CHEMUNG SERIES — CHENEY

Steadied by Brant, a warrior of great force and sagacity, the Indians not only made a stubborn resistance for two hours, yielding inch by inch, but even stood up against the bayonet, something almost unknown in Indian history. At first thrown into a panic by the artillery, Brant rallied them to a fresh and tenacious fight; and noting Poor's turning movement, threw a strong detachment with a battalion of rangers to the hill to oppose it. But at length Poor, having cleared the crest, burst on the rear with a bayonet charge; and both Indians and whites fled across the river in rout, the Indians leaving their packs and weapons behind, and eleven dead, though they usually carry all these away with them. Fourteen other dead Indians were in fact found under the leaves, two canoes were found covered with blood, and the Indians told their western villages that they had many killed and vast numbers wounded. The Americans had six killed and 40 or 50 wounded.

Chemung Series, in American geology, the great series of shoal-water sediments, mostly light gray shales and ripple-marked sandstones, that were laid down in Upper Devonian time in the great northeastern bay of the interior sea that covered much of what is now the Mississippi valley. This northeastern bay stretched across lower Michigan, Ontario, and central New York, reaching nearly to the Hudson River. The Chemung Series includes the Catskill Group and is divided into the Chemung and Portage Stages. It is typically developed on the Chemung River in New York. It reaches its maximum thickness of 8,000 feet in eastern Pennsylvania, but thins out and disappears to the south and west. The "oil sands" of Pennsylvania from which have been taken many millions of barrels of petroleum, are of Chemung age.

The Chemung corresponds to part of the series of shales and limestones laid down in the Northwest Territory and Manitoba, Canada, probably to part of the Devonian strata that extend along the main range of the Rocky Mountains in Canada and to an unknown fraction of the great thickness of Devonian strata in Nevada. In Europe the Old Red Sandstone, a series of sandstones and shales estimated as possibly 10,000 feet thick, is in many respects like the Catskill group of the Chemung, and contains similar fossils. This great sandstone formation is found in South Wales, England, and Scotland, near the Baltic Sea in Russia, in Spitzbergen, and in Greenland.

The characteristic fossils of the Chemung Series in New York and Pennsylvania include, among land plants, tree-fern (*Caulopteris*), and lepidodendrons. The fauna includes, among mollusks, brachiopods and lamellibranchs in great number and variety, no less than 252 species of lamellibranchs having been described from New York. Gasteropods are rare. Of vertebrates the Chemung contains remains of *Pterichthys* and other ancestors of the true fishes, including *Cocosteus*. The *Dipnoi*, or lung-fishes, a connecting link between fishes and amphibians, are represented by species of large size (*Dinichthys*). Of selachians or sharks, but few remains are found. See CATSKILL GROUP; DEVONIAN SYSTEM; OLD RED SANDSTONE.

Chenab, chē-nôb', in Hindustan, one of the five rivers of the Punjab. It rises in the Himalayan ranges of Cashmere, and entering

the Punjab near Sialkot, flows in a southwestern direction till it unites with the Jhelum; length about 800 miles. At Wazirabad it is crossed by a great iron railway bridge more than a mile long.

Chenavard, Paul Joseph, pōl zhō-zěf chā-na-vār', French historical painter: b. Lyons 9 Dec. 1808; d. 12 April 1895. He studied some years in Italy, and acquired a reputation by his picture of 'Mirabeau Replying to the Marquis de Dreux-Brezé.' After the revolution of 1848 he received a commission to paint large compositions for the decoration of the Pantheon. Among these are 'The Deluge' and 'The Passage of the Rubicon.' The Pantheon having been restored to the Roman Catholic worship, he was not permitted to finish the task.

Che'nerly, Thomas, English journalist and Orientalist: b. Barbadoes 1826; d. 11 Feb. 1884. He was educated at Eton and Cambridge. He was called to the bar, but was soon after sent out as *Times* correspondent to Constantinople, where he remained during the Crimean war. Afterward he was constantly employed on the *Times* staff until 1877, when he became its editor, a post which he filled till within 10 days of his death. As a singularly thorough Hebrew and Arabic scholar he had few equals among his contemporaries, and his translation of the Arabic classic, the 'Assemblies of Al Hariri' (1867), led to his appointment to a chair of Arabic at Oxford in 1868. He was one of the company of Old Testament revisers, and besides other works published an edition of the 'Machberoth Ithiel' (1872), a Hebrew version of the 'Assemblies.'

Che'ney, Charles Edward, American clergyman: b. Canandaigua, N. Y., 12 Feb. 1836. He was graduated at Hobart College in 1857, and, after a course at the Theological Seminary of Virginia, was ordained a clergyman of the Protestant Episcopal Church in 1858. Becoming rector of Christ Church, Chicago, he incurred censure for heterodoxy and was tried on that charge and deposed from the priesthood. He at once became a leader in the Reformed Episcopal movement, and was consecrated bishop of the new denomination in 1873, a post he has since held, as well as the rectorship of Christ Church.

Cheney, Ednah Dow (LITTLEHALE), American writer: b. Boston 1824; d. 1904. She was married to Seth Wells Cheney (q.v.) in 1853. She was president of the New England Woman's Club and the Massachusetts Suffrage Association. She wrote 'Handbook of American History for Colored People' (1866); 'Gleanings in the Field of Art' (1881); 'Life of Louisa M. Alcott' (1889); and several stories, including 'Nora's Return,' a sequel to Ibsen's 'A Doll's House'; 'Sally Williams, the Mountain Girl' (1872); etc.

Cheney, John Vance, American poet and essayist: b. Groveland, N. Y., 29 Dec. 1848. He was librarian of the public library at San Francisco, 1887-94, and of the Newberry Library, Chicago, from 1894. He has published 'The Old Doctor' (1885); 'Thistle-Drift,' poems (1887); 'Wood Blooms' (1888); 'The Golden Guess,' a volume of essays (1893); 'That Dome in Air,' essays (1895); 'Queen Helen' (1895); 'Out of the Silence' (1897).

CHENEY — CHENOPODIUM

Cheney, Seth Wells, American engraver: b. South Manchester, Conn., 26 Nov. 1810; d. there 10 Sept. 1856. Upon the death of his father in 1829 he joined his brother John in Boston, where he entered the latter's profession, that of an engraver. A position in the Athenæum enabled him to study and work from casts and drawings, and he copied and engraved in 1832 Washington Allston's picture, 'Mother and Child,' which was afterward burned. In 1833 he studied in Paris in the atelier of De la Roche. His great power was in the expression of character in individual heads. He never attempted historical or genre subjects, and only rarely grouped two or more heads together. Engravings by him may be found in the following annuals. 'Gift of Friendship' (1848); 'Religious Keepsake' (1846); 'Religious Offering' (1840); 'The Token' (1832, 1836, 1837); 'Youth's Keepsake' (1831). See 'Memoir of Seth W. Cheney, by E. D. Cheney' (Bost. 1881), and S. R. Koehler's 'Catalogue of the Works of John and S. W. Cheney.' He was married to Ednah Dow Littlehale in 1853.

Cheney, Theseus Apoleon, American historical writer: b. Leon, N. Y., 16 March 1830; d. Starkey, N. Y., 2 Aug. 1878. His publications include 'Historical Sketch of the Chemung Valley' (1866); 'Historical Sketch of 18 Counties of Central and Southern New York' (1868); 'Laron'; 'Relations of Government to Science'; and 'Antiquarian Researches.'

Chénier, shā-nyā', Andre Marie de, French poet: b. Constantinople 30 Oct. 1762; d. Paris 20 July 1794. He went to France when very young, and entered the army, but left six months after to devote himself to literary pursuits. He was for about three years secretary to the French embassy at London, but in 1790 returned to Paris. Advocating the doctrine of a limited monarchy, he made himself equally offensive to the Royalist and the Jacobinical party. In consequence of his attacks on the Jacobins he was condemned by the revolutionary tribunal, and executed. Although but little known in his own day, Chénier has long been regarded as one of the finest French poets of his century, his chief characteristics being purity of form combined with vigor of thought and diction. He wrote idyls, elegies, odes (including one to Charlotte Corday), dithyrambs, philosophic pieces, etc. The maturity, breadth and soundness of his judgment in poetical composition are demonstrated by his poem on 'Invention.' Of the same year is his fine idyl 'Liberty.' Similar in spirit to this, and of perfect Pindaric form, is the 'Dithyrambic on the Tennis Play' (1791). In his prison of St. Lazare he composed a beautiful elegy, 'The Girl Captive.'

Chénier, Marie Joseph de, a French dramatist, younger brother of André M. Chénier (q.v.): b. 11 Feb. 1764; d. 10 Jan. 1811. He was a Jacobin, and member of the Legislative Assembly in the Revolution. His tragedies—'Charles IX.' (1789); 'Henry VIII.' and 'Calas' (both 1791); 'Caius Gracchus' (1793); and others—brought him fame and success by the accordant of their republican and revolutionary sentiments with the public opinion of the time, rather than by their merits as compositions. His national songs were approved by the best test of such productions,—popularity:

one of them, 'The Parting Song' (*Partant pour la Syrie*), is hardly less famous than the 'Marseillaise.' His satires are full of spirit, point and wit, but often rancorous and unjust.

Chenille, shē-nēl', a round fabric or trimming, made by uniting with two or more sets of warps, either by weaving or twisting, a fine filling or weft, which is allowed to project beyond the warps. This filling is cut at its outer edges, and the fabric is then twisted, assuming a cylindrical shape with weft projecting radically from the central line of warps. The name is applied, also, to lace, carpets, and cloth made wholly or in part from silk threads twisted or woven to resemble the tufted trimming of the same name.

Chenomorphæ, kē-nō-mōr'fē, an order of desmognathous birds, first proposed by Huxley and nearly equivalent to the *Lamellirostres* and *Anseres* (q.v.) of other authors. The palate is closed anteriorly by a thick bony bridge, but the vomer is well developed; the margins of the beak are more or less toothed; the tongue is thick and fleshy; and the down is uniformly distributed over the skin. All of the species are more or less aquatic; most of them are web-footed; and the young are precocial, or able to run from birth. Three very distinct families are recognized: the *Anatidæ*, or ducks, geese, and swans (qq.v.); the *Palamedeidæ*, or screamers (q.v.); and the *Phænicopteridæ*, or flamingoes (q.v.).

Chenonceaux, shē-nōn-sō. See BLÉRÉ.

Chenopodiaceæ, kē-nō-pō-dī-ā'sē-ē, a natural order of apetalous dicotyledons, consisting of more or less succulent herbs or shrubs, belonging to about 80 genera and 600 species. They are mostly innocent weeds, but several, as spinach and beet, are employed as pot-herbs; others for the manufacture of soda. See CHENOPODIUM.

Chenopodium, kē-nō-pō'dī-ŭm, or **Goose-foot**, a genus of plants belonging to the natural order *Chenopodiaceæ* (q.v.), of which it is the type, and distinguished by its hermaphrodite flowers, having five small green scales for the calyx, about five stamens, no corolla, and a fruit consisting of a membranous skin enclosing one black, flat, and shining seed. A number of the species have received the name of goosefoots, from a fancied resemblance to the webbed foot of the goose. The best-known or more remarkable species are:

1. *C. rubrum* (red goosefoot), a common annual, generally found in muddy ground. It has a leafy angular stem, which, as well as the whole plant, is often red. It bears a great number of black seeds, not larger than grains of sand, which are much fed on by birds, and seem to be relished by poultry.

2. *C. bonus henricus* (good King Henry, or wild spinach), a perennial, not uncommon in country churchyards, and places seldom disturbed. It has bright-green, broad, succulent leaves, which were in common use as spinach before the introduction of the present cultivated plant. The early shoots are sometimes used as a substitute for asparagus.

3. *C. quinoa*, the quinoa of Peru, a perennial inhabiting the high table-land of the Cordilleras, where, at the conquest of the Spaniards, it was the only farinaceous grain used as food. It is still

largely cultivated for its nutritious seeds, which are made into soup and bread, and, when fermented with millet, make a kind of beer. The plant is from four to six feet high, and has many angular branches, dull glaucous leaves, of a jagged triangular outline, on long narrow stalks, and flowers forming large compact branched heads, and succeeded by minute strong flat seeds, of a black, white, or red color. The quinoa has been introduced into Europe and is perfectly suited to the climate of England; but the grain has an unpleasant acrid taste, and will not be used as human food when anything better can be got. It is, however, an excellent grain for poultry, makes good green food for cattle, and, being of easy cultivation, may not be without economical value. Very large crops of seed have been grown in France.

In medicine *Chenopodium, ambrosioides*, var. *anthelminticum* is used very extensively as a remedy for the round worm as well as the tapeworm. The oil is the official part used, in doses of 5 to 15 drops, and it is a very efficient anthelmintic, particularly for the round worm, *Ascaris lumbricoides*.

Chen'owith, Caroline van Dusen, American writer: b. Louisville, Ky., 29 Dec. 1846. She has lectured on English literature and history, and is the author of 'Stories of the Saints' (1880); 'Child Life in China' (1882); 'School History of Worcester, Mass.' (1899).

Cheops, kē'ōps, the name given by Herodotus to the Egyptian despot whom the Egyptians themselves called Khufu. He belonged to the rulers who had for their capital Memphis; lived about 2800-2700 B.C., and built the largest of the pyramids. According to Herodotus he employed 100,000 men on this work constantly for 20 years.

Chephren, kēf'rēn, or **Cephren**, king of Egypt, the successor of Cheops and the builder of the second pyramid. The former is the form of his name as it is found in Herodotus, the latter is the name given to him by Diodorus. Herodotus informs us that his reign was in all respects as tyrannical as that of his predecessor, and that the Egyptians, animated by a feeling of hatred against these two kings, under whom they had suffered all kinds of oppression, and during whose reigns the temples had never been opened, avoided even the mention of their names; and hence, instead of naming the pyramids after their builders, named them after a shepherd called Philiton, who used the land in the neighborhood of the pyramids for pasturage. Diodorus adds that the pyramids were intended to serve as tombs for their builders, but as the people threatened to break them open and remove the bodies both the kings desired their friends to bury them in some spot where their bodies might remain undisturbed. Herodotus makes Chephren the brother of Cheops; but Diodorus says that Chembes, who is the Cheops of Herodotus, was succeeded by his son, Chabryis, who may perhaps be the same with the Chephren of Herodotus. His reign lasted 56 years.

Chepstow, chēp'stō, a town and port in England, county of Monmouth, on the Wye River, 14 miles north by west of Bristol. It is pleasantly situated on a slope descending gradually to the river, and has spacious, well-paved, and well-lighted streets. The principal edifices

are the church, a fine specimen of Norman architecture, and the old castle, the ruins of which crown a lofty cliff overhanging the Wye. The ruins of Tintern Abbey are in the vicinity. The building of iron steamships is actively carried on. The beauty of the environs is an attraction to visitors. Both the town and the castle are referred to in 'Domesday Book,' and the castle was the last English fortress to be besieged. Pop. (1901) 3,067.

Cheque. See CHECK.

Chequen, chēk'wēn, the leaves of *Eugenia chequen*, of the family *Myrtaceæ*. A shrub of Chile and Bolivia, whose leaves are rich in volatile oil, and are used as a tonic expectorant in much the same manner as Eucalyptus.

Chequy, chēk'ī, **Checky**, or **Chequered**, in heraldry, applied to a field or charge when it is divided into squares like those of a chess-board.

Cher, shār, France, an inland department having on the north Loiret, east Nièvre, south Allier, west Indre and Loir-et-Cher, between lat. 46° 26' and 47° 38' N., and lon. 1° 50' and 3° 3' E., and formed of parts of Berry and Bourbonnais. It is named from the river Cher, which traverses it southeast to northwest. Area, 7,199.34 square kilometres, or 2,779 square miles; capital, Bourges. This department is included in the basin of the Loire, which forms the greater part of its eastern boundary. The surface is in general flat, but is diversified in the north by chains of inconsiderable hills. Soil various, but fertile in the neighborhood of the Loire and Allier. Heath and sand prevail in the northern districts. The forests occupy above a sixth of the area, and furnish large quantities of fuel for the iron-works, and timber for ship-building. Pastures extensive, and sheep very numerous. Grains, chestnuts, hemp, and wine are among the important products. The best wines are those of Chanignol and Sancerre. Beets, buckwheat, and flax are also grown. The minerals consist of iron, lithographic stones, good building and grind-stones, flint, marble, ochre, and potter's earth. The preparation and manufacture of iron, called Berry-iron, is the principal branch of industry. The manufactured articles are metal goods, fine and common cloth, woolen goods, porcelain and earthen-ware, sacking, beet-sugar, nut-oil, paper, and glass. The department is divided into three arrondissements, 29 cantons, and 290 communes. Pop. 347,725.

Cher, a river of central France, rising in Auvergne in the department of Creuse, and joining the Loire from the left near Tours; length, 220 miles. It is navigable to Vierzon. This river gives name to the department of Cher.

Cherasco, kā-rās'kō, (ancient CLARASCUM), Italy, a town in Piedmont, in the province of Cuneo, near the confluence of the Stura and Tanaro, 22 miles northeast of Coni. Its fortifications, once of great strength, were demolished by the French in 1801. It was repeatedly the object of contest between the French and Austrians in the wars of Italy, terminated in 1631 by a peace concluded here; and in 1796 Napoleon, by what is called the Armistice of Cherasco, obtained a free passage for his troops through the Sardinian states. The town is well built, and has several silk-mills. Pop. 3,500.

CHERBOURG — CHERKASK

Cherbourg, shār-boor, France, a seaport in the department of La Manche (The Channel), 196 miles west-northwest of Paris; on the north coast of the peninsula of Cotentin, and nearly due south of Southampton. It has a strongly fortified arsenal, and consists of the old or civil town, and the new or military (Port Militaire), the latter quite distinct from the former, and separated from it by the fortifications with which it is surrounded. Apart from its consideration as a naval station, Cherbourg is unimportant; it is the works by which it has been converted into a great naval fortress and place of arms that give it its special importance. These altogether have cost £8,000,000, and were chiefly carried out under Napoleon I., Louis Philippe, and Napoleon III. Foremost among them must be mentioned the *digue*, or breakwater, stretching across the entrance to the roadstead, which was formerly open to heavy seas from the north. It is more than two miles in length, of very massive construction, and consists of a western or longer and an eastern or shorter portion, forming at their junction a very obtuse angle pointing toward the north. There are a fort and lighthouse there, and, also, at either end. The breakwater alone cost about £2,700,000. The eastern entrance to the harbor, between the breakwater and the island of Pelée, is about 500 yards wide; the western entrance, between the breakwater and Fort Chavagnac (on a rocky islet), is about 1,000 yards, with a depth of 36 feet. It is the latter that large ships of war make use of.

The Port Militaire has three great basins for war vessels — an outer accessible at all states of the tide for vessels of the largest class; a floating basin communicating with this by gates; and a third communicating with both by similar gates. The aggregate water area of the three basins is about 56 acres, the depth of water being from about 30 to 50 feet. They have been excavated from the solid slate rock which forms the foundation of the entire dockyard, much of the excavated material being used in the construction of the breakwater. There are also slips for vessels of the largest dimensions, dry docks, building sheds, mast-houses, boiler-works, and in short everything necessary for the building and fitting out of ships of war. The numerous forts and other works with which Cherbourg is defended render it, if not impregnable from the sea, at least very difficult of attack. The commercial town has quite a modern aspect, the streets being generally wide, regular, well paved, and clean, but it is rather dull and uninteresting. There is an outer harbor, entered from the sea by a passage between two jetties, and an inner harbor or floating dock. The principal industry of Cherbourg is centred in the works of the dockyard, the commercial trade and manufactures being comparatively small.

Cherbourg is supposed to occupy the site of a Roman station, which is said to have borne the name of Cæsaris Burgum. Aigrold, king of Denmark, we are told, resided here about 945 A.D. William the Conqueror founded a hospital in it, and built the castle church. The English held possession of the place till about 1200. The castle, in which Henry II. frequently resided, was one of the strongholds of Normandy, and escaped the fate of the town, which, about 1295, was pillaged by an English fleet from Yarmouth; but it sustained afterward three memor-

able sieges, in 1378, 1418, and 1450. In 1758 the town was taken by the English without opposition, notwithstanding that the garrison was large. They kept possession of it eight days, destroyed the fortifications, carried off the artillery and the bells, and only retired after having exacted a heavy ransom from the inhabitants. The completion of the fortifications was celebrated by Napoleon III. in 1858, the festivities being graced by the presence of Queen Victoria. A statue of Napoleon I. was unveiled on the occasion. Pop. (1901) 42,952.

Cherbuliez, Charles Victor, shärl vëk-tör shär-bü-lë-ä, French writer: b. Geneva 19 July 1829; d. Melun 1 July 1899. He belonged to a family noted for literary attainments. Having studied in the universities of Geneva, Paris, Bonn, and Berlin, he was for a time an educator at Geneva; but in 1864 became one of the editors of 'Revue des Deux Mondes.' He first gained distinction as art critic and observer of public affairs, as also by his writings, under the pseudonym G. VALBERT. He wrote a volume of art travels in Greece; 'A Horse by Phidias'; 'Political Spain'; 'Foreign Profiles'; 'Art and Nature'; etc. His works are characterized by clever treatment of the problems of domestic and social life and a fine psychological analysis, with a marked bias for description of odd characters. Among his most successful novels — and their success has hardly been less abroad than at home — are: 'Romance of a Respectable Woman' (1866); 'Ladislas Bolski's Adventure' (1869); 'Samuel Brohl & Company' (1877). The last two were dramatized, but won little popular favor on the stage. He was made a member of the French Academy in December 1881.

Cheribon, shër'ī-bōn, Java, a province or residency on the coast toward the northwest of the island, between Krawang and Tegal. It was formerly an independent kingdom. It has a population of about 1,500,000. The productions are coffee, timber, cotton, areca-nuts, indigo, sugar, and also a little pepper. The rhinoceros is native here. The capital of the province, of the same name, is on the north coast, at the mouth of the river Cheribon. The houses are mostly of bamboo. The finest tomb in Java, that of Mulano, who introduced Mohammedism into the island, 1406 A.D., is near here. Population of the city, about 15,000.

Cherimoyer, chër-ī-moi'ër, the fruit of the *Anona cherimolia*, a plant of the order *Anonaceæ*, native of South and Central America, allied to the custard-apple. It is a heart-shaped fruit with a scaly exterior, and numerous seeds buried in a delicious pulp. Both flowers and fruit emit a pleasant fragrance. This fruit is now cultivated in various tropical regions.

Cherith, kër'rīth, the name of a brook to which Elijah was sent during a portion of the years of famine (1 Kings xvii. 3-7), but the locality of which is no further designated than that it was before or on the face of Jordan. The most probable opinion is that it is to be sought for on the east side of the Jordan.

Cherkask, chër'kask, or **Tcherkask**, two towns of Russia, in the government of the Don Cossacks, called Old and New Cherkask, or Staro-Cherkask and Novo-Cherkask. The former is on the right bank of the Don; the latter

is 11 miles farther north, on a hill above the Aksai. Old Cherkask, a very ancient place, the foundation of which is attributed to a Greek colony, is situated on an island formed by the Don, the Aksai, and one of its branches, and is built on piles, as a protection from the inundations which continue from the beginning of April till the end of June. New Cherkask, founded in 1805, has a large cathedral and various other churches, elementary and higher schools, etc., and carries on a considerable trade. It is the seat of government of the Don Cossacks. Pop. 38,476.

Cherm'side, SIR **Herbert Charles**, English general: b. Wilton, Wiltshire, 31 July 1850. He was educated at Eton and entered the army in 1868, and after successive promotions attained the rank of major-general in 1898. He was with the Egyptian army, 1883-8; consul for Kurdistan, 1888-9; military attaché at Constantinople, 1889-96; and has been governor of Queensland from 1902.

Cher'okee ("uplanders," their own name; also rendered Tsaraki, Tsalaki, and Tsanaghi), the largest and most important Indian tribe originally east of the Alleghanies, perhaps the highest in culture and intellectual receptivity north of Mexico. They are of Iroquoian stock, though remotely, and are believed to be identical with the Tallagewi of Delaware tradition, a large tribe once occupying the Ohio and Alleghany valleys, till driven south by the Delawares and Iroquois. Their own tradition, that they came from the west and exterminated a certain "moon-eyed people," does not contradict this. The first white men who encountered them were those of De Soto's expedition in 1540. Our first definite information finds them located along the south—Alleghany and Appalachian ranges and the Piedmont region adjoining, from Virginia to Georgia and Alabama, a range about 120 miles square—and divided into two main branches speaking different dialects: the Otari Tsaraki or Atali Tsalaki (Upper Cherokees), whose main settlements were around the headwaters of the Tennessee and Cumberland; and the Erati Tsaraki or Elati Tsalaki (Lower Cherokee), centred in northern Georgia and southern North Carolina, around the headwaters of the Savannah and Chattahoochee. These location names, however, had become fixed tribal names, and persisted after the Upper Cherokee had been forced south into the region of the others. They were further divided into seven clans, forbidden to intermarry. Lying close to the stream of immigration in the southern colonies, they fill the most conspicuous place in the Indian wars, trade, and treaties of that section in the 17th and 18th centuries; and their chief southernmost town, Etowah, gave a name to the famous frontier fortress Ninety-Six (96 miles from it). At the beginning of the 17th century they are said to have had 64 towns and 6,000 warriors, the latter declining to 3,000 in 1769 and 1,500 in 1793; but the figures are very dubious. At any rate, they had many villages of well-built log-houses, and the Upper Cherokee were agriculturists, raising large crops of corn, beans, and pumpkins; the Lower were chiefly hunters. They sided with the English in the early colonial struggles, and in 1730 formally recognized the supremacy of the English king (though it may be doubted if they attached that

interpretation to their marks). In 1755 they ceded a large tract of land to South Carolina under Gov. Glenn, and Fort Loudoun was built in their territory, it is said by their own request. But after the reduction of Fort Duquesne in 1758, the slaughter of some Cherokees for horse-stealing set the whole tribe aflame, and they requited the massacre ten-fold. The folly of the then governor of South Carolina (Littleton) prevented an arrangement from being made, and a fearful Indian war desolated the borders till 1761, when the harrying of their lands for a month and the burning of 14 villages caused them to sue for peace. Their principal chiefs at this time were Attakullakulla or Little Carpenter, and Oconostota. In 1773 they made a large cession to Georgia.

In the Revolution, like most other Indians, they joined the English, their natural interests being against the Americans; and also like the others, their alliance won no victories for England, but helped lose her the country from the immeasurable odium it excited. Gen. Pickens at last subjugated them; and by a treaty at Hopewell, 28 Nov. 1785, they acknowledged the sovereignty of the United States. This was confirmed by that of Holston, in 1791, with a cession of territory; and other treaties and cessions followed in 1793, 1804, 1816, etc., ending 27 Feb. 1819. The United States on its part solemnly guaranteed to the Cherokees the possession of all lands not ceded by them, recognized their autonomy, and on 30 March 1802, authorized the President to expel trespassers, especially surveyors, by force. In 1790 a portion of the tribe emigrated to Louisiana; and others, mainly Lower hunters, later removed from time to time beyond the Mississippi, till in 1817 there were some 3,000 north of the Arkansas in the present Indian Territory. But the remainder showed an adaptability not equaled by any other Indians, and began a vigorous civilized career, which however only postponed their evil day for a few years. Two influences conduced to this besides their character,—the missionaries and the half-breeds: for almost alone among Indians, the mixture of white blood has prospered with the Cherokees. This blood, however, was singularly fine—that of the best Scotch families, in some cases noble: the Rosses, Adairs, McLeods, McDonalds, etc. After the rising of 1745 a number of these, irreconcilable or "wanted," emigrated to the Carolinas; in the Revolution, not unnaturally, they became loyalists; when it ended and a fresh outlawry menaced them, some of them and their sons pushed on into the Cherokee country, settled there, and intermarried with the native women. The Moravian missionaries had been working among the Cherokees from 1740, and had baptized a considerable number before the Revolution. In 1799 some of the tribe earnestly requested teachers and clergy. A great council was held at Tellico on the Tennessee, at which the Upper chiefs agreed to the plan, but the Lower dissented. In 1804, however, schools and missions were opened, a large part of the tribe were soon Christianized, and the sons of the chiefs attended the schools. The American Board worked successfully among them later.

The Cherokees were now perfectly peaceable, industrious, and rapidly growing civilized in the genuine sense; and they did good service to the United States in the War of 1812. In 1810 they

CHEROKEE

abolished the clan system and blood-feuds. In 1820 they organized a regular civilized government, including a legislature with paid members, and adopted a code of laws. In 1827 they took the name of The Cherokee Nation, and framed a constitution. In 1825 the Cherokee Sequoyah (q.v.) invented an alphabet of 85 letters, one for each sound in Cherokee, and it was officially adopted by the Cherokee government. In 1827 the first Indian press north of Mexico was established, and on 21 Feb. 1828 the first number of the *Cherokee Phoenix* was issued at New Echota, one-half printed in the new alphabet. But the nation's time had come, hastened by the discovery of gold, which they worked successfully. Georgia, on 24 April 1802, as consideration for ceding western lands to the United States, had stipulated that the Indian titles to lands within the State should be extinguished "as soon as it could be done peaceably and on reasonable terms." The government did its best, but found that it had promised the impossible. In 1808 both the Lower (hunters) and the Upper (farmers) sent deputations to Washington. The former expressed a desire to remove to the virgin hunting-grounds of the West, the latter to retain their own. The former, therefore, on 8 July 1817, were granted an exchange of lands to the West. This left about 5,000,000 acres of Georgia in the hands of the Cherokees, and 4,000,000 in those of the Creeks, or about 14,000 square miles in all, nearly a quarter the present area of the State,—the whole northwestern triangle above the line of Atlanta (which was Cherokee land) and Gainesville. In 1819 Georgia began to grow impatient, and memorialized the President to carry out the agreement of 1802. But the remaining Cherokees loved their beautiful and salubrious country, which they had covered with improvements; they had not much more in that mountain country than they needed; and the reports from Indian Territory were that their brethren were being badly harassed by the wild tribes of the plains. They refused to sell as a nation; by all Indian law, confirmed by the United States, no individual could sell, as the land belonged to the tribe; and to prevent sales they dared not disallow, the Cherokees in 1820 passed a law making such sale a capital offense in any member of the tribe. The Creeks duplicated this action in 1824. There was therefore no way for Georgia to rid herself of these two huge Indian states within her borders except by naked violence in defiance of United States treaties. She did so first with the Creeks, 1826-32, openly defying the United States, and proclaiming the separate sovereignty of Georgia (see CREEKS; NULLIFICATION); then in 1828-30 (see title below) passed laws extinguishing the government of the Cherokees and parceling out their land. The President (Jackson) would give no help, the supreme court said it could not; but the Cherokees clung desperately to their land even under the new legislation. Finally, on 29 Dec. 1835, a small fraction of the tribe, headed by a few influential men, were induced by an emissary of the United States to sign a cession of all tribal lands, in exchange for others in Indian Territory and the sum of \$5,700,000, and agree to entire removal within three years. This was of course perfectly invalid; the leaders were immediately assassinated, and were execrated as bribed traitors. There is, however, no

reason to doubt their good faith to the nation. One of them was the still remembered Elias Boudinot, editor of the *Cherokee Phoenix*, who was educated at Cornwall, Conn., and married a Connecticut wife. They probably thought the nation could make better terms by yielding than by holding out. The bulk of the tribe, however, repudiated the treaty, and, refusing to go in 1838, were deported by an armed United States force, after a strong resistance and some bloodshed. Many hundreds, however, escaped on the march, lingered about in the woods, and finally concentrated near the Great Smoky Mountains in western North Carolina, where about 1,400, called the Eastern Band, still live, mainly in Swain, Graham, and Jackson counties. Of those who went, thousands are said to have died on the march or from resultant hardships. The number deported is unknown: probably between 10,000 and 20,000.

The chief of the tribe for nearly 40 years (1828-66) was the able John Ross (q.v.), or Kooweskoowee, a Scotch half-breed; and after fighting the removal to the last, when the crisis came he superintended it. When the tribe had gathered in Indian Territory it resumed its form of government and made Tahlequah the capital; and in 1845 resumed publication of a national paper, the *Cherokee Advocate*—which, however, was suspended in 1854, the present paper of the name dating only from 1870. The nation was doing well till the Civil War came for a blight. The Cherokees were almost equally divided in sentiment; their treatment by Georgia had been capped by that of the national government, and after all they were southerners by birth and industrial sympathies, and slaveholders. Each section furnished a large body of troops to its chosen side, and in consequence each side in turn ravaged the country as a hostile land, and with the consideration usually shown by whites to Indian property; and the land was almost swept bare. After the war they made a new treaty with the United States, freeing their slaves and admitting them to full citizenship in the tribe; and in 1866 they absorbed the remnant of the Delawares. Since then their land has been opened up by railroads, despite their protests. The case of Cherokee Nation v. Southern Kansas Railway, 1889, decided that the United States had right to grant eminent domain through their territory, and in fact four trunk lines traverse it. In 1892 they sold their great western extension, known as the Cherokee Outlet, and it forms the larger part of northern Oklahoma. Their region is the whole of Indian Territory north of the Arkansas. Their present government is by an elected principal chief, and a legislature with two chambers. But their long struggle for national existence is drawing to a speedy close. The open policy of the United States government is to substitute allotment in severalty for tribal ownership as fast as possible, and put an end to the anomaly of independent tribes with a figment of sovereignty which only makes hardship to government, tribe, and innocent outsiders alike. No tribe is better fitted for it than the Cherokee; generations of good living and civilization have not only tamed and elevated the Indian character in them, but greatly modified even the Indian physiognomy; there are scores of full-blooded Indian ladies in Tahlequah scarcely distinguishable from whites save for duskiness of

CHEROKEE NATION V. GEORGIA — CHERRY

skin. A thorough system of public schools among them has been one of the chief instrumentalities in refining both face and character at once. Their number in Indian Territory in 1900 was 25,639; but the Cherokees proper in this enumeration are thought not to be much above 20,000.

Cherokee Nation v. Georgia, the classic case (1831) on the relations of the Indian tribes toward the United States government. (For the preliminary history, see **CHEROKEE**.) The means taken by Georgia to oust the Cherokees were as follows: By six successive acts, from 20 Dec. 1828 to 22 Dec. 1830, Georgia laws and jurisdiction were extended over all inhabitants of the Cherokee territory, and resistance to her writs made indictable; Cherokee laws, usages, legislative assemblies, and courts were abolished, and execution of their writs prohibited; Cherokees were declared incapable of testifying against or making contracts with white men, but the execution of the Cherokee laws against selling land to white men was punished as murder; their lands were ordered surveyed and distributed by lottery among the citizens of Georgia; their improvements and gold mines were confiscated; and white men were forbidden under penalty to enter their country, without a license from the governor and taking the oath of allegiance to Georgia. The Cherokees appealed at once (early in 1829) to President J. Q. Adams, to make good the government's treaty guarantees; but he, as his term was about to expire, left it to Jackson, who, as an old Indian fighter, sympathized with Georgia, refused to interfere, and advised the Cherokees to submit or remove. Their next resort was to the supreme court, but the Georgians took care not to let suits in the State courts come to a decision, and so give opportunity to appeal. At length, however, a case was found. When the Georgia authority over the Cherokee country became operative in 1830 a Cherokee named Cornstassel or George Tassels killed an officer serving a writ of ouster, and was sentenced to be hanged; a writ of error was obtained from the supreme court 12 Dec. 1830, citing the State to appear; the legislature instructed the State officials to ignore it, and the sentence was carried out. The Cherokees' council then applied to the supreme court for an injunction to prevent Georgia from exercising her laws within the Cherokee country; the State put in no appearance, and the case was decided from the arguments on the other side: These were: that the supreme court has jurisdiction over cases between States of the Union and foreign countries; and that the Cherokee Nation, by repeated acknowledgment of the United States in solemn treaties, was such a foreign country, sovereign and independent. Chief Justice John Marshall for the court—Story and Thompson dissenting—decided that they were not a foreign nation in the meaning of the Constitution,—since, for example, an attempt by any other foreign nation to form a connection with them, or to trespass on their land, would be held an invasion of the rights or territory of the United States; that they were a domestic or dependent nation, in a state of pupilage, their relation to the United States being like that

of a ward to its guardian, that their title to their land was only that of occupancy, the United States succeeding to it whenever their own possession lapsed; that their appeal lay to the President; that the supreme court could not call out force to resist the extension of Georgia laws over territory claimed as its own; that it could pass on the title to land, upon suit properly brought, but this question was a political one.

A second case, though not cited under this head, properly belongs with this. Under the law restricting white men's entry into the Cherokee country, 10 missionaries and others were arrested and sentenced to four years' imprisonment, in September 1831. Eight were released on making submission; two refused; and one, Rev. Dr. Worcester, brought suit for a habeas corpus in the supreme court, which gave decision in March 1832, and to the lay mind appears to have reversed its former one. It held that all the acts of the Georgia legislature with respect to the Cherokees were unconstitutional and in violation of the treaties and laws of the United States; and ordered the prisoner released as condemned on a void statute. The State refused to comply; but in place of waiting till the next term of the supreme court, to see if it would call on the United States authorities to enforce the decree, the prisoners made submission and were released. It is probable that Jackson's famous "John Marshall has made his decision—now let him enforce it," would have prevented them from regaining freedom till their term was up.

Cherry, the name of various species of trees and shrubs of the genus *Prunus*, natural order *Rosaceæ*, closely related to the almond, peach, apricot, and plum, thus comprising one of the most important groups of fruits—the drupaceous or stone fruits. Cherries are characterized by white flowers usually in umbel-like fascicles, or in racemes, and sub-globular, mostly red, yellow, or black fruits, without bloom, and containing stout, nearly globular smooth stones. Few of the native species have attracted horticultural attention except for ornamental purposes, but some, especially the wild black cherry (*P. serotina*), are highly prized as cabinet woods and for interior house-finishing.

The cultivated cherries have been derived almost wholly from two European species, *P. avium*, and *P. cerasus*. The varieties of *P. avium* belong to four groups: mazzards, inferior seedlings common in the eastern United States; hearts, heart-shaped, soft, light or dark, sweet fruits; bigarreaus, heart-shaped, firm, light or dark, sweet fruits; and dukes, light, somewhat acid fruits. Of these four groups, the bigarreaus are the most important; they are largely grown in California and shipped to the eastern markets. The hearts are somewhat grown for home on both the Atlantic and Pacific coasts, in Europe, and in Australia. The varieties of *P. cerasus* are divided into amarelle (light-colored) and morello (dark-colored) groups. The morellos are the leading acid cherries and are most popular in the eastern United States, especially in western New York, where they are largely canned for market, as well as shipped in the fresh state.

CHERRY — CHERRY VALLEY

Besides these important species and their varieties, a few others have horticultural value, notably, *P. mahaleb*, a hardy, rather small European species, which is used as a propagating stock; *P. pennsylvanica*, the pin, wild red, or bird cherry, whose hardness seems to promise usefulness in the Western plains region; *P. bessyi* and *P. pumila*, the sand or dwarf cherries, which seem to grade into one another, the former producing sweet fruit, the latter acid, and which, being natives of the plains region, seem worthy of the attention of the hybridizer.

Cherries are propagated by budding upon either mazzard or mahaleb seedlings, the latter being in more general favor, especially in the West, because they are hardier, easier to grow, easier to bud, and are freer from blight in the nursery. Sweet cherries succeed best upon well-drained light loams where the moisture is abundant, but not excessive; sour kinds will stand heavier, but not wet land; neither prove profitable upon very rich soils. The ground should be thoroughly and deeply plowed and harrowed; the sweet kinds, which are large spreading trees, set 25 to 30 feet part, and the sour kinds 15 to 20 feet. The land should be kept clean by frequent cultivation until mid-summer, when a clover crop should be sown. This must be turned under the following spring, and the land treated as before. Each year liberal applications of potash and phosphoric acid should be given and the trees protected from the attacks of insects and fungi by systematic spraying.

Two insects are most dreaded. One is the cherry aphid, which attacks the foliage in May. It is particularly troublesome upon the sweet kinds. Kerosene emulsion and fish-oil soap are each useful in controlling the pest. The other is the cherry slug, a shiny, dark-green worm, the larva of a four-winged black fly. The slug eats the soft tissue of the leaves between the veins. It may be controlled with air-slaked lime or arsenites. See FUNGICIDE.

The most important diseases of the cherry are brown rot, leaf-blight, and black knot, which are treated under PLUM. Mildew (*Podosphaera oxycanthæ*) is troublesome upon nursery stock. It is a gray fungus which causes the leaves to fall, but may be controlled by a fungicide. Consult: Bailey, 'Cyclopedia of American Horticulture' (1900-2).

Cherry, Wild, the bark of *Prunus serotina* collected in autumn. This is very extensively used in medicine as a vehicle basis, the syrup of the bark being used very extensively in cough remedies. It contains a small amount of hydrocyanic acid.

Cherry-laurel (*Prunus lauro-cerasus*), a shrub closely allied to the common cherry, but having evergreen leaves. It was introduced into Great Britain in the 16th century, and is well known as an ornamental shrub. It yields the celebrated laurel-water. This is a powerful poison, the strength of which (like that of peach-kernels, bitter almonds, cherry-leaves, etc.) depends upon the presence of prussic acid. Laurel-water is obtained from the leaves and flowers, or the leaves only, by distillation. This shrub is often called the common laurel, another evergreen species being distin-

guished as the Portugal laurel: both are distinct from the true laurel.

Cherry Valley, Massacre at. The site of this village, in Otsego County, N. Y., was made memorable by the scenes of 11 Nov. 1778. With the exception of the massacre at Wyoming in July previous, that at Cherry Valley was the greatest of those indiscriminate murders of peaceful settlers which inflamed American fury without much diminishing American resources, and loaded England with odium while not advancing her military success. It was led by Lieut. Walter N. Butler, a Mohawk Valley Tory leader, son of the more famous Col. John Butler. He had been captured at German Flats in the summer of 1777, while misusing a flag of truce to incite the inhabitants of the then Tryon County to desert the patriot cause; was sentenced to death as a spy, but unfortunately spared on the intercession of friends, carelessly guarded, and escaped, burning for vengeance on Tryon County. He selected Cherry Valley, a well-known frontier settlement, as the point to strike; because its noted beauty, and the unusual cultivation and morality of its inhabitants, would make the blow resound. Lafayette, seeing its exposed situation, had fortified it with a blockhouse the preceding spring; and Col. Peter Gansevoort, an experienced officer of high reputation, solicited the command. For some reason, however, it was given to Col. Ichabod Alden, a respectable Massachusetts officer, not used to Indian warfare. During the summer the inhabitants lived in the fort and went warily; but by November they had returned to their dwellings. On the 8th Col. Alden received a message through a friendly Indian that at a great meeting of Tories and Indians at Tioga it was resolved to attack the place; and the people begged to take refuge in the fort again. Alden pooh-poohed it as an idle Indian rumor, assured them that he would guard against a surprise, and sent out scouting parties. The party that should have beaten up Butler's went to sleep by a camp-fire on the night of the 9th, and awoke as prisoners of the enemy. Butler had obtained a company of his father's rangers, induced Brant, the great Mohawk chief, to join him, with a few hundred of his Indians, picked up a band of Senecas and other straggling Indians and Tories as he went on, and with about 700 men approached Cherry Valley. Securing from the prisoners, under threat of torture, all information as to the conditions there—as that the officers of the garrison lodged with families near the fort, instead of in it—the expedition camped about a mile southwest of the village on the night of the 10th. It snowed in the night, turning to rain in the morning. As the enemy approached under cover of the thick mist, an Indian fired on a stray settler and wounded him, but he escaped and warned the colonel. That remarkable officer thought the assailant only a straggling Indian, and paid no attention. The rangers stopped near the village to examine their guns, and the Indians sprang forward, the ferocious Senecas in advance, under their chief, Sayenqueraghta, and with them some Tories worse than themselves. In the massacre that ensued, 32 settlers, mostly women and children, besides the colonel and 15 other soldiers, were slain; 30 to 40 prisoners were taken,

also nearly all women and children; and the village was reduced to ashes. Most of the prisoners, however, were released the next day, and sent back; not, probably, from any motives of humanity on Butler's part, his hot temper and hard nature making him as cruel as the Indians, but to effect an exchange for his mother and younger brothers and sisters, in the power of the Americans. The massacre was long charged upon Brant as chief actor, but it is now known that he commanded only his own Mohawks, and kept them in hand, his object being to destroy the fort and garrison, and that the Senecas committed most of the horrors. It fact, it is notable that the only deed of humanity that day was done by a Mohawk sub-chief, and that the worst atrocity was perpetrated in cold blood by a Tory, who was afterward hanged for it.

Cherso, kër'sō, a long, narrow island, in the northern Adriatic, belonging to Austria, yielding wine, olives, and other fruits. It is situated on the Gulf of Quarnero, between Veglia and the mainland, and forms part of Istria. It is about 35 miles long, and the area is 105 square miles. The town of the same name stands on the west coast, and has a population (1890) of 4,725. Pop. of island (1890), 10,180.

Chersonesus, kër-sō-nē'sūs (Greek, a peninsula). This name has been given to several peninsulas, as (1) the Cimbrian Chersonesus, now Jutland; (2) the Taurian Chersonesus, the peninsula formed by the Black Sea and the Sea of Azoff—the Crimea; (3) the Thracian Chersonesus, the great peninsula in Thrace, now the peninsula of the Dardanelles; (4) the Golden Chersonesus, in India beyond the Ganges, supposed to be the Malay Peninsula.

Chert, a crypto-crystalline (not visibly crystalline) variety of quartz closely related to flint, but less translucent and having a more splintery fracture. In geology the term is applied to a considerable range of siliceous rocks, from the impure flints largely formed from the siliceous remains of organisms, sponges and diatoms, found in limestones and other stratified rocks, to the jasperated quartz formed by the alteration of limestones or limy sandstones. Cherts of this last type grade into jasper. See FLINT; JASPER; QUARTZ.

Chertsey, chës'sī or chërt'sī, England, a town in the county of Surrey, 20 miles southwest of London, on the Southwestern Railway, is pleasantly situated on the right bank of the Thames, over which there is a handsome bridge, connecting it with the north or Middlesex side of the river. The houses are mostly of brick, and in general well built. The church of St. Peter has a square embattled tower, and contains a tablet to the memory of Charles James Fox. A school was founded here by Sir William Perkins in 1725 for clothing and educating 25 girls and 25 boys. It is now converted into a public elementary school. There was here formerly a monastery of the Benedictine order, in which Henry VI. was interred, and where his remains lay until removed to Windsor by Henry VII. The chief industries are manufacturing iron, engineering, boat- and steam-launch building, carriage build-

ing, and cabinet work. Vegetables are cultivated for the London market. Chertsey gives name to a parliamentary division. Pop. (1901) 12,762.

Cherub (plural, cherubim), a celestial spirit which, in the angelic hierarchy, is placed next in order to the seraphim. All the several descriptions which the Scripture gives us of cherubim differ from one another, as they are described in the shapes of men, eagles, oxen, lions, and in a composition of all these figures put together. The hieroglyphical representations in the embroidery upon the curtains of the tabernacle were called by Moses (Ex. xxvi. 1) cherubim of cunning work.

Cherubini, Maria Luigi Carlo Zenobi Salvatore, mǎ-rē'ä loo-ē'jē kār-lō zā-nō'bē sāl vǎ tō'rā kā-roo-bē'nē, Italian composer: b. Florence 8 Sept. 1760; d. Paris 15 March 1842. In 1773 he produced a mass, which, with other of his compositions, attracted the attention of the grand duke Leopold, who enabled him to become a pupil of Sarti of Bologna, under whom he studied from 1778 to 1782. As early as 1780 he produced his first opera, 'Quinto Fabio,' at Alessandria, and in 1784 he had already produced eight operas in the theatres of Italy. In 1785 he composed for the London Italian opera 'La finta Principessa and Giulio Sabino'; in 1788 at Turin his 'Ifigenia in Aulida'; and in the winter of the same year he brought out his 'Demophon,' and in 1791 his 'Lodoïska,' at Paris. The latter opera established his fame, and was followed by 'Élisa'; 'Médée'; 'L'hôtellerie Portugaise'; 'Les deux journées'; 'Anacréon'; and his ballet of 'Achilles at Scyros.' In 1806 he produced 'Faniska' at Vienna; in 1809, 'Pimmalione' at Paris; in 1813, 'Les Abencerrages'; in 1814, 'Bayard à Mézières'; in 1821, 'Blanche de Provence'; and in 1833, 'Ali Baba.' He excelled most in sacred music. His celebrated mass in F for three voices, his grand 'Requiem,' his 'Messi Sacrie,' are the noblest monuments of his genius. Haydn and Beethoven pronounced him the greatest sacred composer of the age. In 1822 he became director of the *conservatoire* of Paris, with which he had been connected from the date of its foundation in 1795, and which is greatly indebted to him for its prosperity. The most important of Cherubini's literary works is 'Méthode de contre-point et de fugue,' published in 1835, containing a summary of the lessons in strict composition which for several years he had given at the conservatory. He was enthusiastically devoted to his profession, and his independence as an artist frequently manifested itself. Napoleon for a long time could not forgive him, because on one occasion, when he rudely contradicted him on some point of music, the artist replied: "Citizen Bonaparte, in the art of war you are pre-eminent, but you should leave music to those who understand it."

Cherusci, kē-rūs'sī, the most celebrated of all the German tribes. It is difficult to determine their exact position, owing to the fact that ancient writers sometimes confound the national league formed by the Cherusci with the tribe, properly so called. It seems probable, however, that the tribe was situated in

CHERVIL — CHESAPEAKE AND LEOPARD

that part of Germany lying between the Weser and the Elbe, and having the Harz Mountains on the north and the Sudetic range on the south. This tribe was known to the Romans before 50 B.C. and it is mentioned by Cæsar as a people of equal importance with the Suevi. Their territory was first entered by the Romans under Drusus, the stepson of Augustus; and a year or two later they entered into an alliance with the Romans, and served in their armies. But when Varus attempted to make them tributary to Rome, and subject them to the Roman laws, they formed a confederation with many smaller tribes, and having decoyed Varus into the forest of Teutoburg, destroyed his whole army in a battle which lasted three days, and in which he himself was slain (9 A.D.). Upon this the Cherusci became the chief object of the attacks of the Romans. Germanicus, victorious over the Marsi and Chatti, marched against the Cherusci, whose leaders, Segestus and Arminius (the latter of whom had carried off the daughter of the former), were at war with each other. Segestus, pressed by Arminius, called Germanicus to his aid, who delivered him, indeed, from his danger, but was obliged to return after several campaigns without having obtained any permanent advantages. In the end the Cherusci were overcome by the Chatti in the second half of the first century of our era; but this seems to have been owing more to internal dissensions among themselves than to any natural superiority in their opponents. Before the end of the 4th century they appear as members of the great confederation of the Franks, and after that they are lost sight of.

Cher'vil, a popular name for several plants of the natural order *Umbelliferae*. Leaf chervil or salad chervil (*Anthriscus cerefolium*) is an annual herb native to southern Europe, and has long been cultivated in Europe, but very little in America, for its sweet-scented compound leaves, which are used like parsley for garnishing, flavoring soups, stews, etc., and as a pot-herb. It is of easy cultivation and yields its leaves in about eight weeks from sowing the seed. In some localities it has escaped from gardens and has become a weed. Turnip-rooted or tuberous chervil (*Chærophyllum bulbosum*) is a biennial or plur-annual herb native to southern Europe and has long been cultivated for its small grayish or blackish carrot-like roots, which are eaten either like beets or as a flavoring in soups, stews, etc. Since its seeds lose their vitality very quickly, they should be sown in the autumn, or else stratified until spring. If sown in the fall they need not be expected to appear before spring. Except as just mentioned, the cultivation of tuberous-rooted chervil resembles that of carrots. The name chervil is also sometimes given to sweet cicely (*Myrrhis odorata*), a native of southern Europe, widely cultivated in Europe, where it is also known as Spanish chervil, anise chervil, and myrrh.

Chéry Philippe, fê-lêp shâ-rê, French painter: b. Paris 15 Feb. 1759; d. 28 Feb. 1838. Espousing the cause of the Revolution, he took a part in the siege of the Bastille, and was successively a member of the Convention, member of the first committee of public safety, mayor

of Charonne and Belleville, and chief of police in the department of the Seine. Banished by Bonaparte after the 18th Brumaire, he did not return to France until 1802. His historical paintings gained for him a high reputation.

Ches'apeake and Delaware Canal. See CANAL.

Chesapeake and Leopard, Affair of the, 22 June 1807. The Chesapeake was a 40-gun frigate destined to relieve the Constitution in the Mediterranean; Capt. James Barron was to go out in her as commander of the Mediterranean squadron. She had been refitted at the Washington navy-yard, and made final preparations at Norfolk, reporting ready for service on 19 June. On the 22d she got under way, but expecting no attack from powers at peace with this country, was in no shape for immediate action, and being four months behind time, could not wait. The gun deck was obstructed with various lumber, sick seamen were lying on the upper deck, the cables were not stowed away, the powder-horns were not filled, and the crew was raw and not exercised at the guns. At this time, in the heart of the Napoleonic wars, the high wages and relatively safe employ of the American merchant and even naval service, with the rights of American citizenship immediately obtained, raised the normal rate of desertion from the British navy so much that its officers were much embarrassed and greatly incensed; and Great Britain claimed, as for many years afterward, the right of searching neutrals for deserters and contraband. At the same time, her press-gangs crimped for service any strays who could be caught, of any nationality, and rarely gave any redress. Early in 1807 a British fleet lay off Norfolk watching to intercept some French frigates in the Chesapeake; and a boat's crew deserted bodily and escaped to Norfolk. The captain was told that they had enlisted on the Chesapeake,—which was true of only one, and he under an assumed name; and meeting the latter and another deserter in the streets of Norfolk, was defied. Another vessel, the Melampus, reported three deserters gone to the Chesapeake, but it was proved that they were native Americans illegally pressed. Admiral Berkeley, at Halifax, on complaint of his officers, ordered any of his vessels to overhaul and search the Chesapeake on meeting her outside the United States jurisdiction. The order was carried by the 52-gun flagship, Leopard, Capt. Humphreys, who, after consulting with the local commandant at Lynnhaven, followed the Chesapeake out beyond Cape Henry, hailed her, and sent a boat with a copy of Berkeley's order. Barron, who believed that he had no deserters aboard except the Melampus', which were not really such, honestly denied having any, but refused the right to search; the messenger lieutenant at once left, and within five minutes the Leopard came closer, and Humphreys announced that he should carry out his orders. Barron at once called his men to quarters, and did everything that skill, coolness, and courage could do to prepare for action, but the Leopard almost at once poured her whole broadside into the Chesapeake, and then two more in rapid succession, without the possibility of her opponent replying. Three of

CHESAPEAKE & OHIO RAILWAY

the latter's men were killed, Barron and 17 others wounded, and it was certain that the vessel would be sunk in a short time if the fire kept up, and Barron, to stop a useless massacre, struck his flag. The one English deserter was hunted out and hanged, the three Americans taken and imprisoned. The mass of the country was on fire with indignation; the extreme Federalists at first justified the English course, but were compelled by public feeling to exhibit some patriotism. Even the timid Jefferson, whose course had brought on the catastrophe, interdicted British cruisers from American ports, and demanded disavowal and reparation from Great Britain, which were not given; but he did nothing to prevent the recurrence of such outrages. The unfortunate Barron, who had behaved like a brave man and good officer, and whose instructions had bound him to do nothing to bring on collisions, was made the scapegoat of the popular fury. His own captain screened himself by accusing him, and a court-martial on board his own vessel from 4-8 Jan. 1808, Capt. John Rodgers president, after acquitting him of all blame in every respect but one, found him guilty in not preparing for action as soon as he read Admiral Berkeley's order, and sentenced him to five years' suspension without pay or emoluments. The gross injustice of this is now admitted. One of the judges was Stephen Decatur (q.v.), who never ceased reflecting on Barron till the latter challenged and killed him.

Chesapeake & Ohio Railway, The. The road had its origin in the charter of a company by the legislature of Virginia on 18 Feb. 1836, to build a branch from the Richmond, Fredericksburg & Potomac Railroad, through the county of Louisa, Virginia, and was styled the Louisa Railroad. The road was built under this charter from Hanover Junction (now Doswell), on the Richmond, Fredericksburg & Potomac Railroad, 26 miles from Richmond, to Louisa Court House, 34.7 miles, and was operated by the Richmond, Fredericksburg & Potomac Railroad Company. Subsequently it was extended in short sections at various times under several acts of the legislature to Jackson River, 10 miles east of Covington, Virginia, on the west, and to the City of Richmond on the east, between which points it was being operated in the spring of 1861. Prior to this time, however, in 1850, its name was changed to "Virginia Central Railroad Company."

In 1853, the State authorized the construction of the Covington & Ohio Railroad, from Covington, Virginia, to the Ohio River; work was stopped by the Civil War after about \$3,000,000 had been expended by the State. When the war was over, the State having been dismembered, Virginia and West Virginia united in efforts which resulted in combining the Virginia Central and the Covington & Ohio Railroad Companies, in 1868, under the name of Chesapeake & Ohio Railroad Company and the completion of the road westward to Huntington, on the Ohio River, in West Virginia, in the year 1873.

In 1878 the road was sold under foreclosure and reorganized as The Chesapeake & Ohio Railway Company.

Under legislative authority the road was ex-

tended from Richmond to Newport News, in 1880, and to the Government reservation at Fort Monroe, in 1882. In the meantime it had been extended westward from Huntington to the Big Sandy River, the western boundary of West Virginia, and established connection with the Elizabethtown, Lexington & Big Sandy Railroad Company, in October 1880, opening up through service to Lexington, Cincinnati, and the west and south. In 1888 the road was again reorganized and secured control, through stock ownership, of the Maysville & Big Sandy Railroad Company and the new railway bridge at Cincinnati, giving it a direct through line from tidewater to Cincinnati, Ohio.

In 1892, the Elizabethtown, Lexington & Big Sandy Railroad Company, extending to Lexington, Ky., was acquired, and in 1895 through service to Louisville, Ky., was established by an agreement with the Louisville & Nashville for the joint use of its line from Lexington to Louisville. In the same year the Chesapeake & Ohio Railway Company became owner jointly with the Cleveland, Cincinnati, Chicago & Saint Louis Railway Company of the Louisville & Jeffersonville Bridge Company, giving entrance into Jeffersonville, Ind., and connection with the Big Four Railway northward.

The Richmond & Alleghany Railroad located in the James River valley, 231 miles long, between Richmond and Clifton Forge, Va., was acquired in Jan. 1890, affording a low grade route through from the Ohio River to Newport News. Entrance into Washington, D. C., was secured in 1891, under agreements for the joint use of tracks of the Richmond & Danville Railroad Company (now the Southern Railway Company) and the Washington Southern Railway Company (controlled by the Pennsylvania Railroad Company).

A number of subsidiary lines and branches have been built penetrating mineral and timber regions, among them are the Big Sandy Railway, Kentucky, the Guyandot Valley Branch, Coal River Railway, Cabin Creek Branch, Paint Creek Branch, Gauley Branch, Loup Creek Branch, Piney Creek Branch, the Greenbrier Railway, in West Virginia, and the Warm Springs Valley Branch, Craig Valley Branch, and Buckingham Branch, in Virginia.

The eastern termini of this railway are Washington, D. C., Newport News, Fort Monroe, and (by ferry transfer) Norfolk, Va. From these places it extends westward, passing through the agricultural, Tidewater, and Piedmont regions, crossing the Blue Ridge Mountains and the Shenandoah valley of Virginia, thence through the iron ore regions across the Alleghany mountains and their parallel ranges to and through the coal and timber fields of West Virginia to the Ohio River, at Huntington. One of its lines continues on along the Ohio River within the north boundary line of Kentucky to Cincinnati, Ohio, and another extends from Ashland, Ky., through the blue grass region to Lexington and Louisville, Ky., and Jeffersonville, Ind.

The company owns 1,508 miles and operates over 1,708 miles of road. Two hundred miles of the road owned is laid with second main track. Steel rails 100 pound to the yard are the standard in use. Facilities for handling traffic are ex-

CHESAPEAKE AND SHANNON, BATTLE OF — CHESAPEAKE STAGE

cellent in every respect. It is essentially a low grade from Cincinnati to the Coast. Crossing the mountains the maximum grade ascending eastward in the direction of heavy traffic is only 30 feet to the mile.

In the fiscal year 1904-5 its freight-ton mileage was 3,754,388,306; the ton-mileage of coal handled was 2,463,761,619; and passenger miles run were 192,838,400. In the same year the equipment of the road, including cars and locomotives under construction, consisted of the following: Locomotives, 642; freight cars, all classes, 32,373; passenger, baggage, and express cars, 267. In 1894-5 the equipment was as follows: Locomotives, 355; freight cars, all classes, 13,808; passenger, baggage and express cars, 212. The increase in freight car and locomotive capacity is greater than appears from their number, as the average capacity of freight cars increased from 25.1 tons each to 36.4 tons, and the locomotives are of much greater power.

The capital stock outstanding (1904-5) was \$62,799,100, and the total bonded indebtedness was \$81,700,354.17. The gross earnings from operations in 1904-5 were as follows: Freight, \$16,039,312.56; passengers, \$3,894,144.87; express, mail and miscellaneous, \$790,913.35, making a total of \$20,724,370.78. The net earnings were \$7,473,404.65. The number of employes was 13,272.

DECATUR AXTELL,
Vice-President.

Chesapeake and Shannon, Battle of, 1 June 1813. In the War of 1812, the former vessel (See CHESAPEAKE AND LEOPARD, AFFAIR OF THE), cruised to no purpose from December 1812, till April 1813, and arrived at Boston 9 April. Her captain, Evans, left her on account of ill health, and about the middle of May was replaced by Capt. James Lawrence, famous for the brilliant victory of the Hornet over the Peacock. He accepted against his will; nearly all the officers and crew were new, and the latter second-rate, totally untrained, and sulky over questions of prize money. On 25 May Capt. Broke of the Shannon, lying outside, sent away his consort, the Tenedos, to have a fair chance to fight the Chesapeake alone, and repeatedly urged Lawrence to arrange a duel between the ships. In theory they were evenly balanced; they were of almost exactly the same length; the Chesapeake now carried 50 guns, the Shannon 52; the Chesapeake had 379 officers and crew against the Shannon's 330, but the latter had been trained for seven years under Broke himself, kept in constant artillery and other practice, and was a thoroughly disciplined fighting machine, men used to each other and the officers. On 1 June, however, Lawrence, whose experience had made him despise British skill and courage alike, sailed out to meet his enemy, and at 5.30 P.M. they engaged. After a couple of broadsides, the Shannon's shot cut the Chesapeake's stays, and the latter drifted helplessly stern foremost toward her adversary. There was no salvation but to make sail forward or to board, and both were impossible. The Shannon's broadsides and the musketry fire from her tops swept the Chesapeake diagonally from stem to stern, without the latter being able to fire a shot in reply,

beating in the stern ports and killing or wounding every man on the quarter-deck and the after part, including the men at the wheel. Just before the vessels struck, Lawrence ordered up his boarding party; but almost at the same instant he fell mortally wounded by a musket ball, and was carried below. Not a living person was on the quarter deck, and Broke, with 50 boarders rushed on board unresisted just as the vessels parted. He was in deadly peril from his own guns, which killed his first lieutenant as the latter pulled down the American flag, and so fierce was the resistance from the 30 or so of the American crew who had rallied at the forecastle, that 37 of the boarding party were killed or wounded, including Broke himself. Had the rest of the crew shown even decent pluck, not one of the British would have escaped; but the upper party, heavily overmatched, were killed or driven below, and though the dying Lawrence called out from the cockpit, "Don't give up the ship! Blow her up!" the remainder refused to go above, and surrendered. The Chesapeake lost 61 killed and 85 wounded; the Shannon 33 killed and 50 wounded. The former was towed into Halifax as a prize, turned into a British war vessel, and in 1820 broken up. Lawrence died four days after the battle.

Chesapeake Bay, in Maryland and Virginia, and dividing the former State into two parts, is the largest inlet on the Atlantic coast of the United States, being 200 miles long, and from 4 to 40 broad. Its entrance, 12 miles wide, has on the north Cape Charles, and on the south Cape Henry, both promontories being in Virginia. The bay has numerous arms, which receive many navigable rivers, such as the Susquehanna on the north, the Potomac, Rappahannock, and York on the west, and the James on the southwest. Unlike the shallow sounds toward the south, this network of gulfs and estuaries, with its noble feeders, affords depth of water for ships of any burden, virtually carrying the ocean up to the wharves of Baltimore and the arsenal of Washington.

Chesapeake Bay Dog, the American retriever, so named from the district in which it first became well known. It is a large animal, with a thick coat about an inch and a half long, with an under coat of soft woolly fur to protect the skin. Its legs are rather short, and the feet are well webbed, and it is held to be the finest retriever in the world.

Chesapeake Stage. The rocks of the Chesapeake Stage, a younger Miocene of the Atlantic coast, are clays and marls in the north, and marls and limestones in the south. They differ chiefly from the older Miocene, or Chatahoochee and Chipiola Stages, in the character of the fossils, particularly in the north; these fossils indicating that the climate was much colder in the newer than in the old Miocene. This change of climate is believed to have been due to a change in the direction of the Gulf Stream, which flowed farther from the coast than before. The stage is well developed at Duplin County, N. C., at Yorktown, Va., and along rivers in Maryland. Strata of this age are found at Martha's Vineyard, Mass., and in Texas. See MIOCENE SERIES; TERTIARY SYSTEM.

CHESEBRO — CHESS

Chesebro, chēz'brō, **Caroline**, American novelist: b. Canandaigua, N. Y., 30 March 1825; d. Piermont, N. Y., 16 Feb. 1873. In 1851 a collection of her writings was published entitled 'Dream Land by Daylight: a Panorama of Romance.' This was followed by 'Isa, a Pilgrimage' (1852); 'Victoria, or the World Overcome' (1856); 'Philly and Kit' (1856); 'Peter Carradine' (1863); 'The Beautiful Gate, and Other Tales' (1863); 'The Foe in the Household' (1871); her best work.

Cheselden, chēs'ēl dēn, **William**, English surgeon and anatomist: b. near Melton, Mowbray, Leicestershire, 1688; d. Bath 10 April 1752. At the age of 22 he began to give lectures on anatomy, and in 1711 he was chosen F.R.S. In 1713 he published a treatise on the 'Anatomy of the Human Body,' long a favorite manual of the science. He continued to read his lectures for more than 20 years, during which he gradually rose to the head of his profession. In 1723 he published a 'Treatise on the High Operation for the Stone.' In 1733 was published his 'Osteography, or Anatomy of the Bones.' Cheselden obtained in 1737 the appointment of chief surgeon to Chelsea Hospital, a situation he held till his death.

Cheshire, chēsh'ēr, **Joseph Blount**, American Protestant Episcopal bishop: b. Tarboro, N. C., 27 March 1850. He was graduated at Trinity College in 1869, and practised law from 1872 to 1878. He was ordained to the priesthood in 1880, and, after holding various rectorships, became Bishop of North Carolina in 1893.

Cheshire, or **Chester**, a maritime county of western England, bounded by seven other counties in England and Wales, by the estuaries of the Dee and Mersey, and by the Irish Sea. Its area is 1,026 square miles, of which the greater part is under cultivation. The surface is generally level, the soil mostly a rich reddish loam variously clayey or sandy. There is some of the finest pasture land in England; and cheese, the main product of the Cheshire farmer, is made in great quantities. Extensive tracts of land are cultivated as market-gardens, the produce being sent to Liverpool, Manchester, and other towns. Minerals abound, especially rock-salt and coal, which are extensively worked. Cotton manufacture is carried on at Stockport, Stalybridge, and in the northeastern district, ship-building at Birkenhead and other places. There are numerous railroad lines and a splendid system of canals. The principal towns are Chester, the county town, Macclesfield, Stockport, Birkenhead, and Stalybridge. Pop. 815,000.

Cheshire Cheese. See CHEESE.

Chesney, chēs'nī, **Charles Cornwallis**, English soldier and author: b. 6 Sept. 1826; d. 19 March 1876. He was a well known military engineer, but was still better known as a writer on military themes, publishing 'Campaigns in Virginia' (1863); 'Waterloo Lectures' (1868); 'Military Biographies' (1870). The last named volume contained essays on Gens. Grant and Lee. He was a nephew of F. R. Chesney (q.v.).

Chesney, Francis Rawdon, English explorer: b. Annalong, County Down, Ireland, 1789; d. Mourne 30 Jan. 1872. He was gazetted to the Royal Artillery in 1805. In 1829 he inspected the route for a Suez canal which he proved to be practicable. His first exploration of the route to India, by way of Syria and the Euphrates, was made in 1831, and he made three other voyages with the same object. The idea was taken up by government, who made a grant of £20,000 after his first expedition, but owing to the opposition of Russia it was never brought to a practical issue. He commanded the artillery at Hong Kong from 1843 to 1847. In 1850 he published his 'Expedition for the Survey of the Rivers Euphrates and Tigris,' and in 1868 a 'Narrative of the Euphrates Expedition.' See 'Life,' edited by Lane-Poole (1885).

Chesney, SIR **George Tomkyns**, English writer: b. 1830; d. 1895. He was a colonel in the army, and later a general and K.C.B. and sat in the House of Commons for Oxford in 1892. But he will be longest remembered for his remarkable realistic 'Battle of Dorking' (q.v.) (1871); and his brilliant novel, 'The Private Secretary' (1881).

Chesnut, **Victor King**, American botanist: b. Nevada City, Cal., 28 June 1867. He graduated at the University of California in 1890 and pursued post-graduate work at the University of Chicago and at Columbia University. In 1894 he became assistant botanist in charge of poisonous plant investigation, carried on by the United States Department of Agriculture. He has written: 'Principal Poisonous Plants in the United States'; 'Thirty Poisonous Plants of the United States'; and 'Preliminary Catalogue of Plants Poisonous to Stock.'

Chesnutt, **Charles Waddell**, American author: b. Cleveland, O., 20 June 1858. While still a child he was taken to North Carolina, where he was educated, becoming subsequently principal of the State Normal School at Fayetteville. He removed to New York and entered journalism temporarily, returning later to Cleveland, where he was admitted to the bar in 1887. He has written 'The Conjure Woman'; 'The Wife of His Youth and Other Stories'; 'Life of Frederick Douglass' (in 'Beacon Biographies'); 'The House Behind the Cedars'; and 'The Marrow of Tradition.'

Chess. Chess is a game of strategy resembling war in the sense that it consists of attack and defense, with a definite objective towards which all operations lead and to which they are subordinated. It is called a game, and yet it may aspire to the dignity of an art and science supported by a voluminous literature.

From another point of view I have called it the Athletics of the Intellect, inasmuch as it is a mental struggle between the two players which partakes very much of the nature of physical athletics as contrasted with the training of the mind acquired through information or through logical processes, it being distinguished from such training, as in the former case, information and not the training is the prime object aimed at, and in the latter the

CHESS

processes, while being strictly of a training character, have not the quality of the struggle of mind against mind

From all this it may be seen that the pleasure and use of the game is of a complex character, and so fascinating as to have maintained its charm from the earliest days to the present time.

But while the inference as to the great antiquity of the game is irresistible, at the same time it must be admitted that there is no evidence of its having been known to those nations from whom we directly derive our present culture. There appears to be no trace of it in the Bible or Talmud or contemporaneous Hebrew literature, nor does it appear to be mentioned by any of the classical writers, either Greek or Roman.

The first authentic literature on chess we owe to the Arabs and Hebrews residing in Spain under the Moorish dominion, about the 11th century, although at that time it is quite clear that the game was already well known and widespread among the cultured nations under Mohammedan sway. At all events, the probability is that the game originated in China, whence it passed into India where it was known as "Chartarunga" (meaning a complete army composed of the four divisions: chariots, elephants, cavalry, and foot soldiers), and that from India it spread to Persia, at least as early as the days of Chosroes just before the Arab invasion, *i.e.* about the beginning of the 7th century of our era. In Persia it was then adopted by the Arab conquerors and introduced into Europe.

It is impossible in an encyclopedic article to give anything but a most superficial view of the game, nor is it necessary, as there are numerous text-books for beginners, as well as learned treatises for the advanced student.

The accompanying engraving shows the position of the pieces.

are designated by the generic name or men- divided into pawns or foot soldiers, and pieces or officers, the pawns occupying the front, and the pieces the rear ranks. The four squares counting from the king to the right, are called the King's side, and the four squares from the queen to the left, the queen's side of the board. The squares counting from the white to the black are called files, and in the other direction, rows. Each square in English notation is known by two names, according as the play is by the white or black forces; in other words, the square which when played by white would be the king's 4th, would, when played by black, be called the queen's 5th.

In notation the abbreviations are as follows:

King K.	Queen Q.
King's bishop. K.B.	Queen's bishop. Q.B.
King's knight. K.Kt.	Queen's knight. Q.Kt.
King's rook. . K.R.	Queen's rook. . Q.R.
and Pawns. . . P.	

The movement of the pawns and pieces is as follows:

The pawn moves straight forward one square at a time, with the exception of the first move when he may at the discretion of the player advance two squares. If, however, there is a piece or a pawn, on the diagonal front of the pawn, it may be removed from the board and the opposing pawn put in its place. This is called capturing, and in all cases a capture is effected by such removal of the man captured and the placing of the capturing pawn or piece in its place, such capture constituting a move for the player making the capture.

The rook moves in a straight line throughout the file, or row, unless obstructed by his own or an opposing man. If the obstruction is by an opposing man, it may be captured or not, at the discretion of the player.

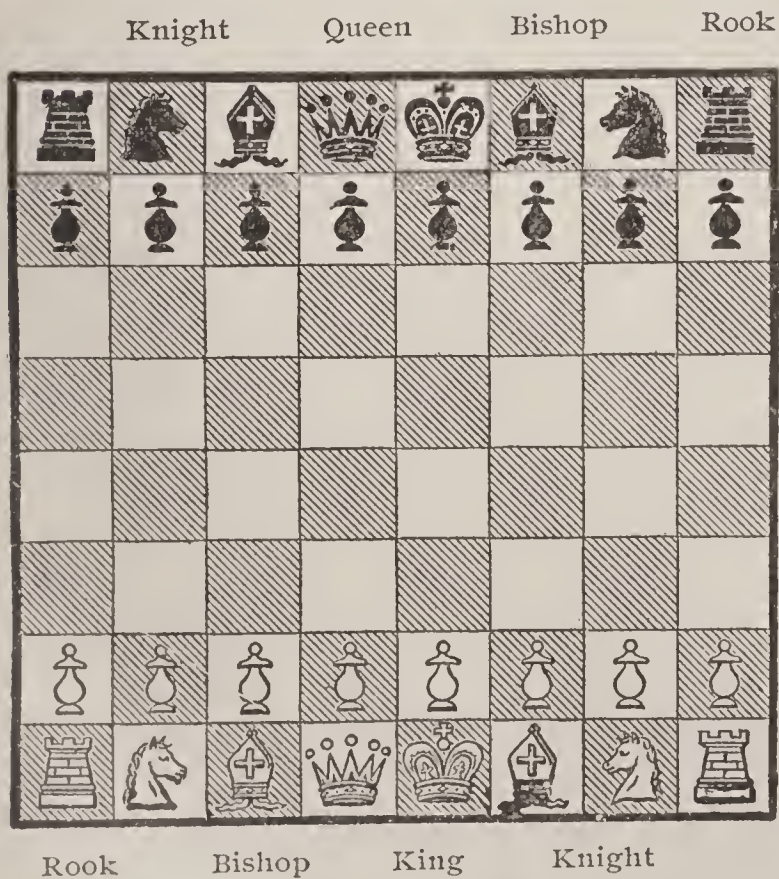
The bishop moves diagonally in any direction over the whole board, unless similarly limited, when it has a similar right of capture.

The knight has a peculiar move over two squares, one of which is diagonal and the other straight, leaping over the intermediate square regardless of its being occupied or not. Thus, in the diagram the knight in K.Kt. square is at liberty to move either to KR3 or KB3—leaping over the pawns, and if he chooses, may return to Kt. square at the next move. He cannot leap into a square which is occupied by one of his own men, but if occupied by an opposing man, he may capture him.

The queen combines the rook and bishop moves, in the sense that she may either traverse in a straight line or in a diagonal line the whole board, so far as the same is unobstructed, with the right to capture any enemy's pawn or piece in her way.

The king moves in any direction but only to an adjoining square. Once during the game he has, however, a right, termed Castling. This is effected by placing the king's or queen's rook—as the case may be—next to the king and causing the king to leap over the rook to the square on the other side. This, of course, can only be done if there are no pawns or pieces intervening between the king and the rook and only in the event of the king and rook used in castling not having theretofore been moved, and also that the

CHESS BOARD.



It will be noticed that the board is divided into 64 squares, and that the opposing forces occupy the limits of these squares. These forces

CHESS

king does not traverse a square controlled by an opposing piece or pawn.

Whenever the king is attacked, the opposing player must give notice by the word "check," and when the king is in such position that he cannot avoid capture, he is said to be check-mated, and the game is lost. Should, however, the king be the only piece capable of moving on the board and his position is such that although not attacked he cannot move without subjecting himself to capture, he is said to be stale-mated, and the game is then considered drawn; that is to say, without being won or lost.

With these pieces and pawns and subject to these and other rules, the opposing players each attempt to capture the opposing king, and when this capture is effected the game ends.

The game is technically divided into three distinct but not well defined parts, namely: the opening, the middle game, and the end game. This division, however, is not a mere truism, as in a great many instances the game is terminated in the middle, never reaching what is called the end game.

The opening is that part of the game where each player seeks to secure the best strategic position for the actual conflict.

The actual conflict takes place in the middle game, which usually results in the capture and exchange of a number of pieces and pawns, as the result of the battle, as it were. If either side emerges from this middle game, or battle, with decided superiority of forces, no end game results but merely what might be called a pursuit. If, on the other hand, after the battle both sides have emerged with relatively equal forces, then comes an effort on either side to defeat the other with the few pieces and pawns that are left, and we have then what is called the end game.

The science of the game as distinguished from the art resides chiefly in the opening, on which there is a mass of literature. There is also a considerable literature on the end game, but there the art of the player predominates over science, as it is practically impossible to exhaust the positions to which the middle and end game may give rise. No player, however, can hope to attain any degree of success who has not mastered the openings, as by failing to do so he is placed at such a disadvantage that no art or skill will avail him against the player who is thoroughly at home in those openings; that is to say, the strategical means of bringing the pieces and pawns into the superior position for the middle game.

The openings may be considered under two categories: conservative openings, and gambits.

In the conservative openings the player looks, in the first place, to the safety of his own lines, seeking principally to fall into no inferiority of position and relying on his skill in the middle or end game to overthrow his opponent. The principal of these openings is the so-called Italian or Giuco Piano, that is, slow play, as follows:

<i>White.</i>	<i>Black.</i>
1. P - K4 -	P - K4
2. Kt - KB 3-	Kt - QB 3
3. B - B4 -	B - B4
4. P - Q3 -	P - Q3

Another favorite opening of this character is what is called the Spanish, or Ruy Lopez:

<i>White.</i>	<i>Black.</i>
P - K 4	P - K 4
K Kt- B3	Q - KtB 3
B - Kt 5	

which produces a far more lively attack and yet carefully guarding the points of defense.

In the Gambits the attack hopes to break through the enemy's lines by a sacrifice, with the expectation of overwhelming the opponent's line of defense before he is able to assume the offensive and take advantage of the weakness of the defensive lines of the first player. The gambit may be either on the king's or queen's side. If it is on the queen's side the second player, by merely refusing to accept the sacrifice, can bring about a game on the lines of the non-sacrificing openings. If the gambit, however, is on the king's side, whether the sacrifice is accepted or not, there is no chance for slow development.

The varieties of the king's gambit are, therefore, extremely great, and we can only give a few for illustration:

<i>White.</i>	<i>Black.</i>
1. P - K 4	P - K 4
2. P - KB 4	P x P

If now Kt plays B3, we have the so-called king's knight gambit; if the B plays to B4, we have the bishop's gambit; if the king's knight gambit is played, a great number of recognized continuations follow—the most interesting of which are those where in addition to the pawn a Kt is sacrificed. Of these gambits only three are known to the present day; the first is the Muzio Gambit, where the continuation is as follows:

<i>White.</i>	<i>Black.</i>
B - B 4	P - KKt 4
Castles	P - KKt 5
Q x P	P x Kt
- - - -	

The second, which is known for over 100 years, is the Allgaier, where on the 4th move White plays P-KR 4, and then the game continues:

5. P - Kt 5 -	Kt - Kt 5
6. P - KR 3	Kt x KBP
7. K x Kt	

The third of these is the Rice Gambit, which the writer discovered about ten years ago and which has been named after him. In this gambit, on the 5th move, Kt goes to K5, an old move attributed to Kieseritzky in the middle of the last century, but probably a good deal older, against which the defense may continue as follows:

<i>White.</i>	<i>Black.</i>
- - - -	Kt - KB 3
6. B - B 4	P - Q4
7. P x P	B - K 3
8. Castles	

the Rice Gambit is produced.

By this move the knight is sacrificed, and To give an idea of the infinite variety of attack and defense possible on the 64 squares of the board, it need only be said that since the discovery of this move thousands and thousands of games have been played based upon it, covering a period of over ten years, and it is impos-

CHEST—CHESTER

sible to state even now, whether or not the sacrifice is advantageous or disastrous for the attack, or whether as a final result it should lead to a drawn game.

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ISAAC L. RICE,

Formerly President Manhattan Chess Club, Inventor of the Rice Gambit.

Chest, in man and the higher vertebrates, the cavity formed by the breast-bone in front and the ribs and backbone at the sides and behind, shut off from the abdomen below by the diaphragm or midriff. It contains the heart, lungs, the great arteries and veins, the trachea or windpipe, the bronchi or branches of the trachea, leading to the lungs, several important nerve-trunks, the thoracic duct, by means of which the lymph and chyle are discharged into the blood, and the œsophagus or gullet passes through it. The diseases of the chest are generally known by the organ affected. The lungs and air-tubes are subject to pleurisy, pneumonia, bronchitis, tuberculosis (consumption) (q.v.); the heart to pericarditis, endocarditis, enlargement, degeneration, etc., and the arteries to aneurism and degeneration of the walls. See ANATOMY; HEART; LUNGS; NOSE AND THROAT; THORAX; RIB; BREATHING AND HEALTH; INFLUENZA; NERVOUS SYSTEM; RESPIRATION; SKELETON; ETC.

Chest-foundering, a disease in horses, a rheumatic affection of the muscles of the chest and fore-legs, impeding both respiration and the motion of the limbs. It in some degree corresponds with what is called pleurisy in man.

Chester, Albert Huntington, American chemist and mineralogist: b. Saratoga Springs 22 Nov. 1843; d. 1903. He graduated from the Columbia School of Mines in 1868 and became a mining engineer. From 1870-92 he was professor of Chemistry in Hamilton College. He wrote a 'Dictionary of the Names of Minerals'; and 'Catalogue of Mineral With Their Chemical Compositions and Synonyms.'

Chester, Colby Mitchell, American naval officer: b. New London, Conn., 29 Feb. 1844. He graduated at the United States Naval Academy in 1863; fought under Farragut in the famous battle of Mobile Bay; became captain 12 June 1896; was commandant of cadets at Annapolis 1890-4; commanded the Galena, Richmond, Newark, Minneapolis 1895-7; the Cincinnati during the war with Spain, and the Kentucky 1900-1. From 1897-8 he was commander-in-chief of the South Atlantic squadron; from 1901-2 was at the Naval War College; in 1903 became rear-admiral; and from 1 Nov. 1902 to 28 Feb. 1906 was superintendent of the United States Naval Observatory.

Chester, Joseph Lemuel, American genealogist: b. Norwich, Conn., 30 April 1821; d. London, England, 26 May 1882. His earlier

life was taken up chiefly with mercantile pursuits, but his strong literary tastes found expression in contributions to the 'Knickerbocker.' From 1845 to 1850 he was musical editor of Godey's 'Lady's Book,' and in 1852 became one of the editors of the Philadelphia *Inquirer*, and of the *Daily Sun*. In 1858 he went to England to sell some patent rights, but not succeeding in the undertaking, settled in London, and devoted himself to genealogical investigation. For more than 20 years he collected materials illustrating the ancestry of American families, made special researches for clients, and investigated the English descent of noted Americans, especially that of George Washington. His greatest work was the editing and annotating of 'The Marriage, Baptismal and Burial Registers of the Collegiate Church or Abbey of St. Peter, Westminster,' dedicated to the queen (1876), a work that cost him 10 years' labor, and which he generously allowed the Harleian Society to issue as one of its publications. He was a founder of this society in 1869, and edited five of its volumes. He was also a member of the Royal Historical Society, and of many other learned societies in England and America. His non-genealogical writings were: 'Greenwood Cemetery, and Other Poems' (1843); 'Treatise on the Law of Repulsion' (1853); 'Educational Laws of Virginia: the Personal Narratives of Mrs. Margaret Douglas' (1854); 'John Rogers, the Compiler of the First Authorized English Bible, the Pioneer of the English Reformation, and its First Martyr' (1861), a work of great industry and research.

Chester, England, an ancient and episcopal city, the capital of the county of Cheshire, 16 miles southeast of Liverpool. The two main streets cross each other at right angles and were cut out of the rock by the Romans four to ten feet below the level of the houses. The houses in these streets were curiously arranged; the front parts of their second stories, as far back as 16 feet, form a continuous paved promenade or covered gallery, open in front, where there are pillars and steps up from the street below, with private houses above, inferior shops and warehouses below, and the chief shops of the town within. St. John's Church, now partially in ruins, is supposed to have been founded by Ethelred in 698. Chester still preserves its old walls, two miles in extent, and the gateways have been rebuilt during the last century. Pop. (1901) 36,281.

Chester, Pa., a city and port of entry of Delaware County, on the Delaware River, and the Philadelphia, Wilmington & Baltimore, the Baltimore & Ohio, and the Philadelphia & Reading R.R.'s, 15 miles south of Philadelphia. The favorable location and excellent shipping facilities of the city have given it a diversity of industries.

Business Interests.—Chester is the local trade centre of a very prosperous agricultural and manufacturing district. It is the site of the Roach ship yards, where several vessels of the United States navy have been built. According to the Federal census of 1900 Chester

CHESTER — CHESTNUT

had 315 manufactories, employing \$18,977,710 capital and 7,682 hands, and having annual products to the value of \$16,421,725. The principal industries were ship-building, foundry and machine-shop work, and the manufacture of cotton, woolen, and worsted goods. In 1900 there were three national banks with \$700,000 capital and a surplus of \$575,000, several private banking houses, daily and weekly newspapers, and an assessed property valuation of \$42,000,000.

Public Interests.—Chester is connected with Media, Darby, and other surrounding towns by electric railways. It is the seat of the Pennsylvania Military College and Crozier Theological Seminary, and Swarthmore College is nearby. The notable buildings are the United States Government Building, including the post-office; the city hall, erected in 1724, of great historic interest; Chester and Homœopathic hospitals, and the public library. Besides the educational institutions mentioned, there were at the close of the school year 1897-8, 23 public schools, with 125 teachers and 5,446 pupils, and public school property valued at \$500,000; a public high school, and Chester Academy.

History.—Chester was settled by the Swedes in 1643, under the name of Upland, and is the oldest town in the State. It was incorporated in 1866. Pop. (1900) 33,988.

Chester, S. C., capital of Chester County, on the Cheraw & Chester, the Chester & Lenoir, and the Seaboard Air Line R.R.'s, 65 miles north-northwest of Columbia. It is a trade centre, cotton is the chief shipping product. Pop. (1900) 4,680.

Chester Stage, the youngest of the limestones laid down in the interior sea that covered, in Lower Carboniferous or Mississippian time, much of what is now the Mississippi valley. Limestones of this stage are found in Texas, Arkansas, Kentucky, Tennessee, and Alabama, and in places reach a thickness of 600 feet. Some of the Lower Carboniferous limestones of West Virginia correspond in age to the Chester. The characteristic fossils include several genera of lamellibranchs and brachiopods. See CARBONIFEROUS; (*Mississippian.*)

Ches'terfield, Philip Dormer Stanhope, 4th EARL OF, English statesman and orator: b. London 22 Sept. 1694; d. 24 March 1773. On the accession of George I. Gen. Stanhope, his great-uncle, procured him the place of gentleman of the bed-chamber to the Prince of Wales; and the borough of St. German, in Cornwall, elected him to Parliament, though he had not yet attained the legal age. He soon acquired distinction as a speaker, which he maintained also in the Upper House after his father's death in 1726. In 1728 he was appointed ambassador to Holland, and succeeded in delivering Hanover from the calamities of the war by which it was threatened. He was afterward, in 1744, appointed lord-lieutenant of Ireland, and on his return in 1746 received the place of secretary of state; but in 1748 retired from public affairs, and devoted the remainder of his life almost entirely to study and the society of his friends. His talents as an author were displayed in several moral, critical, and humorous essays, in his parliamentary speeches, which were printed at a later period, and particularly in a collec-

tion of 'Letters to his Son' (1774), which have become famous. To the charms of wit and grace he united good sense, a thorough knowledge of the manners, customs, and the political condition of Europe, and a polished style. The moral tone of his letters, however, is low. One is shocked to hear a father recommending to his son grace of manners as the most essential quality for a man of the world, and even instigating him to licentious irregularities. Another series of letters addressed to his godson, and published in 1889, show Chesterfield in a more favorable light.

Chesterfield's Letters to His Son. (1774.) These were not written for publication, but were intended by Chesterfield to aid in training his son and forming his character; and were first given to the public after the Earl's death. Begun when the boy was but seven years old, the earlier ones are filled with rudimentary instruction regarding history, mythology, and the use of good language; later follows what has been called "a charming course of worldly education," in which mingle philosophical truths, political sophistries, petty details regarding wearing apparel, and so on. Almost every page contains some happy observation or clever precept worthy to be remembered. The letters show evidences of the lax morality of the times; but are remarkable for choice of imagery, taste, urbanity, and graceful irony.

Chesterfield, England, a town in Derbyshire, on the Midland Railway, 24 miles north of Derby. It has a large market-place and five principal streets, and is irregularly but substantially built. Among its public buildings are a large parish church, noteworthy for its crooked wooden spire 250 feet high, a commodious town-house, guild-hall, grammar-school, the Stephenson Memorial Hall, and the Chesterfield Institute. The principal manufactures are gingham, lace, earthenware, leather, etc., but a majority of the working people are employed in connection with the collieries, iron-mines, quarries, and blast-furnaces of the vicinity. There are also iron-foundries, corn-mills, and engine-works. Mrs. Radcliffe, the celebrated romance-writer, was born at Chesterfield, and a branch of the Stanhope family takes the title of earl from it. Pop. (1891) 22,009; (1901) 27,185.

Chesterfield Inlet, Dominion of Canada, an inlet of Hudson Bay, 250 miles long, and 25 miles across at its widest part. It receives the waters of several rivers, and contains numerous small islands.

Ches'terton, Gilbert K., English author: b. London. He has published 'Wild Knight and Other Poems'; 'The Defendant'; 'Carlyle' (1903); 'Browning' (1903).

Chesterton, George Laval, English sporting journalist: b. London 20 July 1856. He entered a newspaper office in Exeter at 14, was bandsman in the Third Dragoon Guards, 1875-8, special correspondent to the *London Morning Advertiser* from Bechuanaland, 1884-5, and since 1892 has been sporting correspondent to the *Morning Advertiser* over the signature "Arion." He has published: 'Racecourse Reminiscences'; 'Racing Reflections'; 'Won by a Head.'

Chestnut, chēs'nüt, a genus of trees, and shrubs (*Castanea*) of the natural order *Cupu-*

CHESUNCOOK — CHEVALIER

liferæ. The species are characterized by long male catkins and bristly ovaries (burs) which contain rounded nuts. Three species are of wide economic use, their wood being used for many purposes, their bark for tanning, and their nuts for food. In America the most important species is the common chestnut (*C. americana*, by some writers considered a variety of *C. sativa*), which is a tall spreading tree often attaining a height of 100 feet and a girth of 10 or more feet in the forests, which are usually upon high gravelly or sandy land or mountain sides where clay and limestone are absent or in but slight evidence. Its range is from New England to the high lands of Alabama and westward to southern Michigan. During the closing half of the 19th century this species attracted the attention of horticulturists, who have produced about a score of improved varieties worthy of being cultivated for their nuts. The Japanese chestnut (*C. crenata*, by some botanists considered a variety of *C. sativa*), has long been cultivated for its large nuts, which are produced by very young trees and are highly prized for food. The trees are rather dwarf, compact and symmetrical, and free from the attacks of blights, qualities which, together with their ease of propagation, have commended them to orchardists throughout the world. During the closing years of the 19th century it came into prominence in America. The European chestnut (*C. sativa*) a native of southern Europe, northern Africa, and western Asia, is a large tree which forms great forests throughout its range. Its nuts are probably more widely used as food than those of either of the other species, being a principal article of diet in the western countries bordering the Mediterranean Sea. In America it has become popular with orchardists on account of its large nuts. Of the three species the American produces the finest-flavored nuts, but they are generally much smaller than those of the other two species.

Two other American species are valued for their nuts. The tree or common chinquapin (*C. pumila*), which is usually less than 10 feet tall, but occasionally attains a height of 30 feet or even more, is found from Pennsylvania to Florida and westward to Indiana and Texas. The bush chinquapin (*C. alnifolia*, considered by some botanists a variety of *C. pumila*) rarely attains a height of five feet. It is found in the South Atlantic States and westward to Arkansas. Both these species bear small ovoid pointed nuts about half the size of ordinary American chestnuts. They are as yet little cultivated and have produced few varieties.

The various species and their varieties are readily propagated from seed. The seedlings are, however, generally grafted to choice varieties, and when the grafted plants are one or two years old they are set in orchards and cultivated like other fruits or are allowed to care for themselves. In places where chestnuts grow naturally, the sprouts which arise from the stumps of felled trees are often grafted with European or Japanese varieties, and the land pastured with sheep. The principal enemy of the chestnut is the weevil, a beetle which lays its eggs in the young nuts and destroys them or injures them so much as to prohibit their sale when mature. No satisfactory remedy or preventive has yet been discovered.

Chestnuts are eaten raw, boiled, or baked, or are used in many culinary preparations such as dressings. They are often dried and ground into flour, which is used like wheat flour in bread- and cake-making. Sometimes they are used for making confectionery. Fresh chestnuts have the following average percentage composition: Water, 45.0; carbohydrates (principally starch), 42.1; protein, 6.2; fat, 5.4; ash, 1.3.

Chesuncook (chē-sūn'kūk) **Lake** is in Piscataquis County, Maine. It is really an expansion of the Penobscot River, is 20 miles long, and 2,500 feet above sea level.

Chettik, chēt'ik, a tree of Java, the *Strychnos Tietze*, yielding a very virulent poison called by the same name, more powerful than that obtained from the upas-tree, and owing its virulence to the strychnine it contains.

Chet'tle, Henry, English dramatist and pamphleteer; d. about 1607. He was editor of Greene's 'Groat'sworth of Wit' (1592), wrote 13 plays of considerable merit, and was part author of 35 others; including 'Robin Hood' in two parts; 'Patient Grisel'; 'The Blind Beggar of Bethnal Green'; and 'Jane Shore.' In Mere's 'Palladis Tamia' (1598) he is mentioned as one of the "best for comedy amongst us." Of his other works, his 'Kind-Hart's Dreame' (1593?), and 'Englande's Mourning Garment' (1603), are of interest, the former as containing an apology undoubtedly intended for Shakespeare as one of those whom Greene had attacked; the latter, a stanza supposed to be addressed to Shakespeare as "silver-tongued Melicert."

Cheval, shè-väl, **À** (French, from the word meaning horse), on horseback, astride any object. In a military sense, a body of troops is said to be *à cheval* of a river, if one wing is stationed on the right and the other on the left bank.

Chevalier, shě-vä-lē-ā, **Albert**, English comedian: b. 21 March 1861. He is of Italian, French and Welsh blood. His first appearance was at the age of eight. For many years he was associated on the stage with the Kendals, John Hare, etc. For four years he appeared in music halls, then he came into vogue as a drawing-room entertainer with his coster ballads. He has made tours in England and America and has given 1,000 recitals at Queen's Hall, London. Besides 100 sketches, monologues and plays, he has written, 'Before I Forget.'

Chevalier, Michel, mē-shël, French economist: b. Limoges 13 Jan. 1806; d. Montpellier 28 Nov. 1879. He was educated as an engineer in the School of Mines, joined the Saint Simoniens, and suffered six months' imprisonment for promulgating the free doctrines of Père Enfantin's party. On his liberation he renounced his extreme doctrines, and was sent to the United States and to England on special missions. He became a councilor of state (1838), professor of political economy in the Collège de France (1840), member of the chamber of deputies (1846), and member of the Institute (1851). He published 'Letters on North America' (1836); 'On the Materials of Interest in France'; 'Essays on Industrial Politics'; 'Course in Political Economy'; 'His-

CHEVALIER—CHEVIOT

tory and Description of the Ways of Communication in the United States' (1840-2); 'Mexico: Ancient and Modern' (1863). He was known as a strong advocate of free-trade, and as a specialist on questions of currency. With Cobden and Bright he had a great part in the commercial treaty of 1860 between France and Great Britain.

Chevalier, shě-vä-lē-ā or shěv-ā-lēr', an honorary title given, especially in the 18th century, to younger sons of French noble families. Brought up in comparative luxury, and left at the death of their fathers almost entirely unprovided for, these men generally lived at the expense of others, as a sort of aristocratic parasites, even when they did not prefer recourse to such less honorable means of livelihood as gave occasion to the synonym for swindler, *chevalier d'industrie*. In the plays of the 18th century the chevalier is a constant figure. Both the Old and Young Pretender were each called the Chevalier by their partisans. The word is at present often used with its old meaning, and a chevalier may mean a man of honor.

Chevaux de Frise, shě-vō-dē-frēz (Friesland horses, so called because first used at the siege of Groningen, in that province, in 1658), armed beams of square timber or iron used to defend the fronts of camps, breaches, etc. They are usually from 15 to 18 feet long, and connected by chains, each being perforated with small holes to receive rods of wood or iron, pointed at their extremities, and when moved in any direction making a sort of hedge of spears.

Cheverus, shě-vrūs, **Jean Louis Anne Madeleine Lefebvre de**, lē-fāv'r dē, French bishop and cardinal of the Roman Catholic Church: b. Mayenne, France, 28 Jan. 1768; d. Bordeaux 19 July 1836. He was destined for the Church and at the early age of 12 years received the clerical tonsure: he was ordained priest in 1790. Refusing to take the constitutional oath regarding the clergy he was imprisoned at Paris as contumacious in 1792, but escaped to England. There he soon acquired the English language and engaged in missionary work, but in 1796 came to Boston, Mass., where he was soon in high repute for his kindly Christian demeanor and his graceful and winning pulpit eloquence. In an epidemic of yellow fever in the city he won the hearts of all men by his heroic self devotion in ministering bodily and spiritually to the stricken. Learning of the spiritual destitution of the Catholic Abenaki Indians on the Penobscot and the Passamaquoddy in Maine, he began the study of their language, and having attained some proficiency in it he visited their settlements and remained among them at his first visit three months; and every year thereafter he repeated his visit to them, built them a church, and procured for them a missionary priest, who thereafter till his death, 20 years later, devoted himself to their spiritual care. On the occasion of a visit of President John Adams to Boston, the two seats of honor at a public banquet were reserved for the chief magistrate and the priest. Mr. Adams' name headed the list of names of subscribers to a fund to erect a church for

Cheverus' congregation. In 1810 he was consecrated bishop of Boston and entered on the duties of the episcopate with a zeal and industry that taxed his strength to the utmost, and his physicians in 1823 counseled his return to his native land. There the French king, Charles X., named him to be bishop of Montauban, and in this new field his religious and charitable zeal was not relaxed: on the occasion of a disastrous flood he harbored in his episcopal residence 300 destitute people. In 1826 he was made bishop of Bordeaux and a peer of France by King Charles X. Here in a visitation of cholera he placarded his episcopal palace as a *maison de secours* or dispensary. At the instance of King Louis Philippe the Pope, Pius VII., in 1836 created him a cardinal. See Life, by Huen-Dubourg (1837).

Cheves, chēvz, **Langdon**, American statesman: b. Rocky River, S. C., 17 Sept. 1776; d. Columbia, S. C., 25 June 1857. He began to study law at the age of 18, entered upon his profession with superior natural qualifications and after severe discipline, he rapidly attained eminence and wealth in its practice. He was a representative in the national congress before and during the War of 1812, and was a zealous supporter of the party which carried the declaration of war. He was chairman of the Naval Committee in 1812, and of the Committee on Ways and Means in 1813, and constantly opposed the restrictive system. When Henry Clay was sent as commissioner to Ghent, Cheves succeeded him as speaker of the House. He retained this office till 1815, and not one of his decisions was reversed by the House. The bill for the recharter of the United States bank in 1815 was lost by his vote. The national bank having been rechartered in 1816, that institution under injudicious management had become hard pressed and was on the verge of stoppage in 1819, when Cheves was elected president of its board of directors. By a rigorous system of retrenchment, and by making credits only upon sufficient securities, the bank was saved, and specie payments maintained at the principal centres of commerce; but the public clamor increased against the power of an institution charged with subjecting to itself all the monetary concerns of the country, and even the national treasury. Resigning this arduous office after three years, he became chief commissioner under the treaty of Ghent for settling some of its provisions. He returned to South Carolina, concentrated his labors upon his plantation, and though retaining his interest in public affairs, declined to accept any further public office.

Chevet, shě-vā, a variety of the apse, almost exclusively confined to French Gothic churches. The extreme end of the chancel or choir is called the chevet.

Cheviot (chěv'ī-ūt) **Hills**, a range on the borders of England and Scotland, stretching southwest to northeast for above 35 miles. Their culminating point, known specially as the Cheviot, has a height of 2,676 feet; Carter Fell, the next in height, is a little more than 2,000 feet high. They are clothed for the most part with a close green sward, and are pastured

CHEVIOT SHEEP — CHEVY CHASE

by a celebrated breed of sheep admirably adapted for hilly districts, and known in many of the more elevated districts of Great Britain.

Cheviot Sheep, a breed of sheep of large carcass and valuable fleece, which has been pastured from time immemorial on the Cheviot Hills, on the borders of England and Scotland, and from its powers of endurance is justly regarded as the most valuable mountain sheep of Great Britain. The peculiar features of the Cheviots are the absence of horns in both sexes; white or mottled-gray face and legs, an erect, long, and clean head, destitute of wool, while both the throat and neck are well covered, long open ears well covered with hair, and altogether a fine open sprightly countenance, with every indication of hardiness. The fleece weighs from three to four pounds, and the weight of the carcass varies in ewes from 12 to 16, and in wethers from 16 to 20 pounds per quarter. The Cheviots, though originally confined to a small area, are now spread over all parts of the kingdom, and except on the most barren and stony grazings, are far more profitable than the heath breed.

Chevreul, Michel-Eugène, mē-shĕl ě-zhān shĕ-vrĕl, French chemist: b. Angers 31 Aug. 1786; d. Paris 9 April 1889. He was educated in his native town, and when a youth went to Paris, and was employed in the chemical factory of Vauquelin. In 1813 he became professor of physical science in the Charlemagne Lyceum; in 1824 he was made director of dyeing in the carpet manufactory of the Gobelins; and in 1830 succeeded Vauquelin in the chair of chemistry at the Museum of Natural History. He was the author of 'Lectures on Chemistry Applied to the Art of Dyeing' (1831) and other treatises on chemistry and dyeing, and an important work on the 'Principles of Harmony and Contrast of Colors,' 1839, which has been translated into English. He was a commander of the Legion of Honor, and the centenary of his birth was celebrated in Paris with much enthusiasm.

Chevreuse, chĕv-rĕz, Marie de Rohan Montbazon, mōn-bā-zōn, DUCHESS DE, French political adventuress: b. December 1600; d. Gagny, near Paris, 12 Aug. 1679. When scarcely 17 years old, she married Charles d'Albert, grand constable of France, then a favorite of Louis XIII., who died four years afterward. She next became the wife of Claude de Lorraine, Duke of Chevreuse. A great friend of Anne of Austria, she incurred the hatred of Richelieu, and succeeded so well in making herself obnoxious to him, that he determined to have her arrested; but, made aware of his project, she assumed man's attire, crossed the Somme by swimming, and fled to England. For years she was an exile from France, and King Louis XIII. had been inspired by his minister with such fear of her uncontrollable spirit and cunning, that in his will he forbade her return to France. In spite of this, Anne allowed her to return, without, however, showing her the same degree of confidence as before, and the queen's coldness induced the duchess again to leave the court. Afterward she engaged in new plots against Mazarin, mostly acting in concert with Cardinal de Retz, and was once more compelled to leave France.

Her intriguing spirit outlived her beauty, which had so much contributed to her former successes. She wandered through the Netherlands, Germany, and England, still persisting in plotting against her enemies.

Chevron, shĕv'rŭn, a bent bar, rafter-shaped, in heraldry. A chevron is, according to some, a third, and, according to others, a fifth of the field. A chevronel is half a chevron, and the couple close the fourth of the shield. A chevron coupé is that which does not reach the sides of the escutcheon. A chevron in chief is one which rises to the top of the shield. In architecture a chevron is a zigzag molding, characteristic of Norman work.

Chevrotains, shĕv'rō tānz, a family (*Tragulidæ*) of ungulates, which though ruminant, in the general sense, differ in many respects from true deer; they resemble the true *Cervidæ* in certain minor peculiarities, and the musk-deer in others; but anatomically they are, in the main, distinct, especially in such of the more important characteristics as make naturalists class them by themselves. The chevrotains are divided into two genera, one African, and the other Asiatic, the latter genus (*Tragulus*) being that of the true chevrotains. These form a group of diminutive, hornless, deerlike animals, standing only about 12 inches high, found in southern India, Ceylon, and the Malayan peninsula. They are usually reddish, tawny, or mouse-grey in color, except the Indian mouse-deer (*Tragulus meminna*), which is flecked with white. The "water-deer" of western Africa is a kindred species, as is also the species found in the Philippines. Wherever found, these animals are sly little creatures, with a peculiarly stiff manner of walking, and given to hiding in thickets and inaccessible crags. They may, however, be readily tamed. They are considered as a survival of the Miocene form to which is also attributed the ancestry of the deer.

Chevy Chase, chĕv'ī chās, the name of a celebrated border ballad probably founded on some actual encounter occurring between Percy and Douglas, although the incidents mentioned in it are not historical. It is this ballad that Sir Philip Sydney speaks of when he says, in his 'Defense of Poetry,' "I never heard the old song of Percie and Douglas that I found not my heart moved more than with a trumpet"; and which is made the subject of a critique by Addison in Nos. 70 and 74 of the 'Spectator.' On account of the similarity of the incidents in this ballad to those of 'The Battle of Otterbourne,' the two ballads have often been confounded; but the probability is that if any historical event is celebrated at all in the ballad of Chevy Chase, it is different from that celebrated in 'The Battle of Otterbourne,' and that the similarity is to be explained by supposing that the incidents were borrowed.

There are two versions of the ballad bearing the name of Chevy Chase, an older one and a more modern one. The older version is sometimes called the 'Hunting of the Cheviot,' which is its original title. It begins thus:

"The Persè owt of Northombarlande,
And a vowe to God mayd he,
That he wolde hunte in the mountayns
Off Chyviat within dayes thre,
In the mauger of doughtè Dogles,
And all that ever with him be."

CHEW — CHEYENNE

Neither the exact age nor the name of the author of this version is known. From the fact that it is mentioned in the 'Complaynt of Scotland,' written in 1548, where it is called the 'Huntis of the Chevot,' it is clear that it was known in Scotland before that time, and since James of Scotland is mentioned in the ballad, it may be inferred that it was not written before the reign of Henry VI., for James I. did not ascend the throne of Scotland till two years after Henry VI. had become king of England. As for the author, it is true that a manuscript of the ballad contained in the Ashmolean collection at Oxford is subscribed by one Rychard Sheale, but it is likely that this Rychard Sheale was merely one who had frequently recited the ballad, and perhaps the person who committed this old version to paper. This is probably the version with which Sir Philip Sydney was acquainted, since he speaks of it as "evil apparelled in the dust and cobweb of an uncivil age."

The age of the more modern version is no better known than that of the older one, but it is said by Dr. Rimbault to be no later than the reign of Charles II. This is the version which forms the subject of the critique by Addison in the above-mentioned numbers of the 'Spectator.' The following is the opening stanza as given in Percy's 'Reliques':

"God prosper long our noble king,
Our lives and safetyes all;
A woefull hunting once there did
In Chevy-Chace befall."

Chew, Benjamin, American jurist: b. 29 Nov. 1722; d. 20 Jan. 1810. He studied law in Philadelphia under Andrew Hamilton, and in London. He began the practice of his profession in Philadelphia in 1745; and held a number of public offices, becoming chief justice of the State in 1774. In 1776 after the adoption of the Declaration of Independence, he took a decided stand against the patriot cause, and was imprisoned at Fredericksburg, Va., because he refused to sign parole. In 1790 he became president of the high court of errors and appeals, a position which he held until the court was abolished in 1806. He lived in Germantown in a large stone house which is still standing and shows the marks of the cannonading it received during the battle of Germantown, when a party of British took refuge there and were fired upon by the American artillery. See **GERMANTOWN, BATTLE OF**.

Chewing-gum, a resinous gum used as a masticatory. The habit of chewing gum is perhaps peculiar to the United States. At first the resinous exudations of the spruce, cherry, etc., were employed in their native state; but with the increase of the habit the spruce supply nearly failed, and recourse was had to other ingredients. Of late years a gum known as chicle (q.v.) has come to the front as the foundation of most of the chewing-gum. The chicle gum is chopped into fine particles, dried, and then cooked in steam-jacketed kettles. At this stage sweetening and flavoring ingredients are added to the mass, which is mixed mechanically. The resulting "dough" is then kneaded on a table and rolled between rollers having knives set into their faces. These knives cut the sheets into suitable sizes for the market, and, after drying, the sticks are wrapped, packed, and shipped.

Chewink'. See **TOWHEE BUNTING**.

Cheyenne, shī-ě̃n (Sioux, "red," i. e. foreigners = enemies: their own name = "ours"), an important Indian tribe of the great Algonquin stock, and its westernmost member except the Blackfeet. In the 18th century they lived on the Sheyenne River in eastern North Dakota, but were gradually driven southwest by the Sioux to the forks of the Big Cheyenne near the Black Hills, where Lewis and Clark found them in 1803. Originally settled agriculturists, their acquisition of horses turned them, like the other plains Indians, into nomad raiders and led to their foraging even to Mexico, and claiming lands as far apart as the upper Missouri in northern Montana, and the forks of the Platte, though they numbered but little over 3,000. The first United States treaty with them was made in 1825 in the former locality. They had already fraternized with the Sioux; and when their location at the Black Hills grew unsatisfactory, one section (the "Northern Cheyenne") joined the Ogallalla Sioux in driving the Crows from the Powder and Tongue river valleys in southeast Montana, while the remainder (the "Southern Cheyenne" moved south and formed a confederacy with their Algonquin kinsmen, the Arapaho, on the Arkansas. In 1851 a treaty was made with the Northern band at Fort Laramie, on the North Platte, to cut roads through their lands. A number of treaties were made with the Southern, but it is alleged that the commissioners neither made them intelligible nor executed them fairly; the Cheyenne, with their Indian allies, committed the usual atrocities which were their one method of retaliation; the settlers clamored for their extermination; the military desired to cow them by heavy punishments; the Indian department blamed both and wished peace. The Indian commissioner in 1864 sent some 400 Cheyenne and Arapaho to a camp at Sand Creek, Col.; Col. Chivington fell upon them 29 November (see **SAND CREEK MASSACRE**), and butchered 131 men, women, and children. A bloody and costly war followed; the next year the tribe consented to go upon a reservation, except a band called the "Dog Soldiers," who held out. In 1867 Hancock burned their village at Pawnee Fork, and another war with them began. On 27 Nov. 1871, Custer inflicted a crushing defeat upon them at the Washita in Indian Territory, killing Black Kettle, their chief, and compelling them to return to their reservation. The Northern band all this time remained peaceful, despite urgent solicitations from their brethren and the Sioux. Fresh treaties were made in 1866 and 1868. In 1900 the Northern Cheyenne numbered 1,357, on a reservation in the Tongue River valley, Custer County, Mont., and were increasing. The Southern Cheyenne are united with the Arapaho, in Oklahoma; their reservation was on the Canadian River, near Elreno, but was opened up in 1892. They number about 2,100, and are governed by a council of five chiefs. The Cheyenne are a tall, finely built race, the best physically of all the plains Indians except the Osages; but rather dull intellectually. Their language is one of the most difficult even of Indian tongues.

Cheyenne, Wyo., city and capital of the State, and county-seat of Laramie County; on the Union Pacific, C. & Northern, and Burling-

ton Route R.R.'s, 150 miles north of Denver. Cheyenne is situated on a plateau 6,075 feet above the sea and contains Fort Russell, a United States military post, and the main repair shops of the Union P. R.R. It has a fine State House, waterworks, electric lights, a public library, high school, and two national banks, and is the great beef growing centre, the shipping point for beef-cattle to eastern markets, and the supply depot for a large amount of the trade of the Rocky Mountain region. Pop. (1900) 14,087.

Cheyne, chān, George, Scotch physician: b. Methlick, Aberdeenshire, 1671; d. Bath, England, 13 April 1743. He started a London practice in 1702, in which year he was elected a Fellow of the Royal Society. Full living made him enormously fat, as well as asthmatic, but from a strict adherence to a milk and vegetable diet he derived so much benefit that he recommended it in all the later of his dozen medical treatises, which included 'A New Theory of Fevers' (1701); 'Philosophical Principles of Natural Religion' (1705); 'Essay of Health and Long Life' (1725); and the 'English Malady, a Treatise on Nervous Disorders' (1733).

Cheyne, Thomas Kelly, English biblical scholar: b. London 18 Sept. 1841. He was educated at Merchant Taylors' School, Worcester College, Oxford, and Göttingen. In 1868 he was elected Fellow of Balliol College, from 1880 till 1885 he was rector of Tendring in Essex. In the latter year he was appointed to the Oriel professorship of the interpretation of Scripture at Oxford, also becoming canon of Rochester. He edited the Old Testament portion of the Variorum Bible for Messrs. Eyre and Spottiswoode, and in 1884 became a member of the Old Testament Revision Company. His numerous works deal exclusively with the exposition and criticism of the Old Testament books. They include: 'Notes and Criticisms on the Hebrew Text of Isaiah' (1868); 'The Book of Isaiah Chronologically Arranged' (1870); 'The Prophecies of Isaiah' (1880-1, new ed. 1884); 'The Book of Psalms Translated' (1884); 'Job and Solomon' (1887); 'The Book of Psalms or Praises of Israel' (1888); 'Jeremiah: his Life and Times' (1888); 'The Hallowing of Criticism' (1888); 'The Origin and Religious Contents of the Psalter' (1891); 'Founders of Old Testament Criticism' (1893); 'Introduction to the Book of Isaiah' (1895); 'Religious Thought and Life Among the Hebrews' (1898); 'Isaiah, Critically Revised' (1897-9); 'The Christian Use of the Psalms' (1899). He has also written many articles on similar subjects in various periodicals, and is joint editor of the 'Encyclopædia Biblica.' Canon Cheyne's works reveal a scholarly and able attempt to reconcile the views of the advanced critics of the Bible with those belonging to the evangelical school.

Cheyne, William Watson, English surgeon. He was educated at Edinburgh University and was Hunterian professor of the Royal College of Surgeons of England, 1888-90. He has published: 'Antiseptic Surgery: its Principles, Practice, History, and Results' (1882); 'Manual of the Antiseptic Treatment of

Wounds' (1885); and other important professional works.

Cheyney, Edward Potts, American educator and sociological writer: b. Wallingford, Pa., 17 Jan. 1861. After graduating from the University of Pennsylvania in 1883, he took a post-graduate course there, and later traveled abroad, studying in German universities, and in the British Museum. Upon his return he was appointed professor of European History in the University of Pennsylvania. He has written: 'Social Changes in England in the 16th Century' (1896); 'Social and Industrial History of England' (1901); 'A Short History of England' (1904); 'Background of American History' (1905); etc.

Chézy, Antoine Léonard de, äñ twäñ lä-ō-när dè shā-zē, French Orientalist: b. Neuilly, France, 15 Jan. 1773; d. there 31 Aug. 1832. He began his studies in the École Polytechnique, and afterward attended the lectures of Andran, Caussin, and Silvestre de Sacy, on Oriental literature. Unassisted, he taught himself Sanskrit, and became such a proficient in it that, in 1814, a chair of Sanskrit was formed expressly for him in the College of France. Among his productions is a free French translation of the Persian poem, 'Medjnun and Leila.' He also published Kalidasa's drama of Sakuntala, in the original, with a translation accompanied with notes (Paris 1830).

Chézy, Wilhelm von, German novelist and historical essayist: b. Paris 21 March 1800; d. Vienna 13 March 1865. He was the son of A. L. Chézy (q.v.). He acquitted himself creditably as a journalist, and wrote many popular tales: 'The Wandering Pupil' (1835); 'The Six Noble Passions' (1842); and 'The Last Janissary' (1853), among them; as well as 'Chivalry in Picture and Word' (1848), a study of much value.

Chézy, Wilhelmine Christiane von Klenck, German poet and novelist: b. Berlin 26 Jan. 1783; d. Geneva, Switzerland, 28 Feb. 1856. She received an excellent education, and was married in her 16th year to a gentleman of the name of Hastfer, from whom she separated about a year later. She shortly afterward became the wife of Antoine Léonard de Chézy (q.v.), but, separating from him as from her former husband, she engaged in various literary pursuits. She has acquired considerable celebrity by her 'Poems' (1812); 'Heart Notes During a Pilgrimage' (1833); and 'Emma's Ordeal' and other novels, but is perhaps best known as the writer of the libretto of Weber's opera of 'Euryanthe.'

Chhatisgarh, chüt-tēs-gär', India, the southeast division of the Central Provinces, with an area, including feudatory states, of 25,013 square miles. It is mainly a vast fertile plateau, and has of late become a great centre of the Indian grain trade. Dongargáon is the capital. Pop. 3,545,000.

Chhindwara, India, a district in the central Province of Nerbudda, situated on the southern slopes of the Salpura Mountains. Its area is 3,915 square miles. Large forests cover the greater portion of the country and a great supply of coal has recently been found there. In the upper part of the district the climate is very

CHIABRERA — CHIAROSCURO

mild, and it sometimes is cool enough to form ice. The annual rainfall averages about 36 inches. Pop. (1900) 400,000, of whom more than one half are Hindus.

Chiabrera, Gabriello, gä-brē-ël'lō, kē-ä-brä'rä, Italian lyric poet: b. Savona 8 June 1552; d. Savona 14 Oct. 1637. Impatient of dependence on the great, he again and again abandoned the courts of noble patrons. He visited Rome, and resided a considerable time at Florence and Genoa, settling finally in his native place. Wherever he went he was loaded with presents and honors. Pindar and Anacreon were his models among the poets, and his countrymen named him "the Italian Pindar," but his Pindaric odes have little grace and force, being labored rather than spontaneous. Some of his little songs after Anacreon are models of elegance and grace. He wrote epic and dramatic poems also. He left a charming autobiographical sketch. His collected poems were published under the title of 'Rime.'

Chiaja, a fashionable driveway in modern Naples, commencing at the Largo Vittoria and extending for a mile along the coast. On one side is the public park, the Villa Nazionale, and on the other side are many handsome and imposing buildings and hotels.

Chian (kī'än) **Turpentine**, a greenish-yellow, non-acrid turpentine or resin obtained mainly from the island of Chios (Scio), yielded by *Pistachia terebinthus*, of the order *Anacardiaceæ*, a large tree, native to the Mediterranean islands and shores. The turpentine, now used only in medicine, exudes from the tree in small quantities during the warmer months, but it is obtained at other seasons by making incisions in the bark. It is called also Cyprus turpentine.

Chiana, kē-ä'nä (the ancient *Clanis*), a river of central Italy, originally a tributary of the Tiber, watering a perfectly level valley, which its overflow rendered once the most pestilential district of Italy. The bed was deepened in 1789-1816, and in 1823 extensive hydraulic works were undertaken for further improving the river course, and for leading a north branch, through canals, to the river Arno, a few miles below Arezzo, the south stream reaching the Tiber through the Paglia at Orvieto. The double stream is 60 miles long, and one half to one mile broad; and the district has since become one of the most fruitful in all Italy.

Chianti, kē-än'tī, a district in Italy, near Siena, where what is now the best-known red wine of Italy is produced. Chianti wine is full flavored and astringent, with an alcoholic strength of about 20 per cent.

Chiapanecs, or **Chapanecs**, a tribe of Indians inhabiting the state of Chiapas in the southern part of Mexico. They were at one time very powerful and evidently were well advanced in agriculture and picture-writing. They also had made some progress in mechanical art and lived in well-made houses. They were never conquered by the Aztecs but the Spaniards easily overcame them. A few remaining members of the tribe still exist in central Chiapas and probably the Mangues of Nicaragua and the Guetares of Costa Rica are descendants of the race.

Chiapas, chē-ä'pas, a state of the republic of Mexico, on the Pacific slope, having an

area of 27,111 square miles. The capital is Tuxtla-Gutiérrez. The state is in many parts mountainous, and is also in many parts traversed by fine streams, including the Rio Chiapas. At Palenque are the ruins of an ancient Aztec city of great beauty and magnitude. The valleys have a rich soil and produce maize, sugar, cotton, etc. There is a considerable export of logwood. Trade is, however, in a backward state for lack of roads. Education is free and compulsory, but the law is not strictly enforced. The state forms part of the Central American tableland, and has a fine climate, although the whole region is largely clothed in primeval forests. Pop. 364,000.

Chiari, Pietro, pē-ä'trō kē-ä'rē, Italian novelist and comedian: b. Brescia 1700; d. Brescia 1788. After completing his studies he entered the order of Jesuits, but soon changed the monastic for the secular life, and devoted himself solely to letters. He resided at Venice, with the title of poet to the Duke of Modena, and in the space of 10 or 12 years brought more than 60 comedies on the stage. Chiari and Goldoni were rivals, but the public adjudged the palm to the latter. Chiari's dramas in verse fill 10 volumes; those in prose, four.

Chiari (known to the Romans as *CLARIUM*), Italy, a town in Lombardy, 14 miles west of Brescia. It is well built, has several churches, two convents, an elementary school, a hospital, and a public library. It was formerly fortified, and some of its ancient defenses still exist. It has manufactures of silk, linen, and cotton, and some tanneries. Prince Eugene here defeated the French and Spanish troops, 1 Sept. 1701. Pop. 11,000.

Chiarini, Giuseppe, joo-sēp'pē kē-ä-rē'nē, Italian poet and critic: b. Arezzo 17 Aug. 1833. He is a student of foreign literatures, especially English and German, and has been editor of literary journals. His verse is mostly lyrical, and has been collected under the titles: 'Poems' (1874); 'In Memoriam' (1875); 'Lacrymæ' (1879); etc. It gives proof of deep poetic sensibility. He has translated some of Heine's poems, and has published critical essays on English and German poets.

Chiaroscuro, kē-är-ös-kū'rō, or **Chiaroscuro**, kē-ä-rō- (It. *chiaro*, "clear"; *oscuro*, "obscure"), in painting the art of judiciously distributing the lights and shadows in a picture. A composition, however, perfect in other respects, becomes a picture only by means of the chiaroscuro, which gives faithfulness to the representation, and therefore is of the highest importance for the painter; at the same time it is one of the most difficult branches of an artist's study, because of the want of precise rules for its execution. Every art has a point where rules fail, and genius only can direct. This point in the art of painting is the chiaroscuro. The drawing of a piece may be perfectly correct, the coloring may be brilliant and true, and yet the whole picture remain cold and hard. This we find often the case with the ancient painters before Raphael; and it is one of the great merits of this sublime artist that he left his masters far behind him in chiaroscuro, though he is considered not so perfect in this branch as Correggio and Titian, who were inferior to him in many other respects. The

CHIASTOLITE — CHICAGO

mode in which the light and shade are distributed on any single object is easily shown by lines supposed to be drawn from the source of the light which is shed over the figure; but *chiaroscuro* comprehends, besides this, aerial perspective, and the proportional force of colors, by which objects are made to advance or recede from the eye, produce a mutual effect, and form a united and beautiful whole. *Chiaroscuro* requires great delicacy of conception and skill in execution; and excellence in this branch of art is to be attained only by the study of nature and of the best masters. *Chiaroscuro* is also understood in another sense, paintings in *chiaroscuro* being such as are painted in light and shade and reflexes only, without any other color than the local one of the object, as representations of sculpture in stone or marble. There are some fine pieces of this sort in the Vatican, at Rome, by Polidoro da Caravaggio, and on the ceiling of the Paris Bourse by Meynier and Abel de Pujol.

Chiaastolite, *ki-as'to-lit*, a variety of the mineral andalusite, occurring in stout crystals of prismatic aspect, and distinguished by containing carbonaceous impurities that are distributed through the interior according to a geometric scheme, so that a section of the crystal presents a tessellated appearance or shows a distinct cross. Also called "macle." The name "chiaastolite" is derived from a Greek word signifying "arranged diagonally."

Chiavari, *kē-ä-vä'rē*, Italy, a seaport in the compartimento of Liguria, province of Genoa, on the Gulf of Rapallo, 23 miles southeast of Genoa. It has all the appearance of an old Italian town, consisting of narrow streets lined with substantial houses and open arcades. Silks, lace, etc., are manufactured, and fishing and trading are carried on. Pop. 13,000.

Chiavenna, *kē-ä-vēn'nä*, Italy, a town on the Mera 38 miles north-northwest of Bergamo, in the province of Sondrio, Lombardy. It stands in a valley in the midst of magnificent scenery on the road to the Splügen, and at the junction of two passes through the Alps, and has an important transit trade. Pop. (1901) 4,788.

Chibchas, *chēb'chäs*, or **Muyscas**, a tribe of South American Indians who formerly lived east of the Magdalena River, occupying the region from its head waters to the Sierra Nevada de Merida. They were partially civilized and excelled in weaving and pottery making, were skilful goldsmiths and also followed agriculture to a considerable extent. They were ruled by women as well as men in the line of succession, and believed in a Supreme Being, although they worshipped the sun and stars. The Chibchas were conquered in a war with the Spaniards in 1537 and their descendants, who have intermarried with Europeans constitute a large part of the present population of Colombia.

Chibouque, *chī-book'*, a long Turkish pipe having generally a wooden stem, an amber mouth-piece, and a clay bowl.

Chica, or **Chicha**, *chē'chä*, a South American word having several meanings.

1. A species of *Sterculia*, the seeds of which are eaten in Brazil. They are about the size of a pigeon's egg, and have an agreeable taste.

2. A red coloring matter prepared by the Indians on the upper parts of the Orinoco and the Rio Negro from the leaves of a plant native to that region called *Bignonia chica*, and with which they paint their skin, in order to be better able to resist the rays of the sun. It is of a beautiful vermilion color, and, although of a resinous nature, is not liable to become liquid under the influence of heat. It is soluble in alcohol, and stains cotton orange-yellow. It is extracted by boiling the leaves in water, decanting the decoction, and allowing it to settle and cool when a red matter falls down, which is formed into cakes and dried. It is also called *carajuru*.

3. A dance popular among Spanish South Americans. It is said to have been introduced into Spain by the Moors, and to have been the origin of the fandango, which some writers declare to be the *chica* under a more decent form. It is similar in character to the dance of the Angrismene performed at the festivals of Venus, and still popular among the modern Greeks.

Chica, *chē'kä*, **Pito**, *pē'tō*, or **Po'so**, a kind of beer made from maize, in general use in Chile, Peru, and other mountainous regions of South America. It was the national drink of the natives long before the appearance of the Spaniards. The most ordinary method of preparing it is to steep the grains of maize until they begin to sprout, when they are exposed to the sun. The malt thus prepared is then ground, mixed with warm water, and left to ferment. The beer, when ready, has a dark-yellow color and a pleasant and somewhat bitter and sour taste. It is consumed by the Indians in great quantities. In the valleys of the north the Indians chew the malt instead of grinding it. It is then mixed with warm water and other ingredients and allowed to ferment as before. In a short time the beer is ready. When it has been buried for some time in the earth in pitchers it has a violently intoxicating effect. This kind of *chica* is called *chica mascada*, and is said to be much preferred by good judges to the ordinary sort.

Chicacole, *chik-a kōl'*, or **Cicacole**, India, a town in the Ganjam district, Madras Presidency, near the coast, about 567 miles northeast of Madras, notable for its fine muslin manufactures. On two occasions, namely in 1791 and 1866, it suffered much from famine, and in 1876 a flood did considerable damage to the town. Pop. 18,241.

Chicago, Ill., the second city in the Union, is in Cook County, and lies on the southwestern shore of Lake Michigan. The dome of the court-house is in north latitude $41^{\circ} 53' 6.2''$, and longitude $87^{\circ} 36' 1.2''$ west. The city has a shore line on the lake of 26 miles, and extends 10 miles inland. The city area, 190.638 square miles, covers a great part of the alluvial plain formed by the Chicago and Calumet rivers. The Chicago River is formed by the junction of two small rivers, the north and south branches, thus dividing the city into three portions commonly known as the North, South, and West sides, respectively. Calumet River is the outlet by which the shallow sheet of water known as Calumet Lake empties into Lake Michigan. The land on which the

CHICAGO

city is built is level and lies quite low, the elevation above Lake Michigan being only 25 feet. The two rivers form natural harbors, which have been improved by dredging. The shore of Lake Michigan is broken by few bays or inlets, and harbors are infrequent, and, as a rule, not commodious. Wherever, therefore, a river is found, navigators eagerly use it, so far as its depth permits, as a refuge from the storms of the great lake.

Early History.—In the early days of French exploration it was found that the Indians used the Chicago River as one line of travel by which the Mississippi could be reached. Passing up the river and its south branch, a portage of only four or five miles brought the traveler to the Desplaines River, down which his canoe passed to the Illinois River, and so to the Mississippi. This route seems to have been used by white men for the first time in 1673, when Joliet and Marquette, returning from the Illinois River, were shown by the Indians the Chicago portage. It may be that they descended to Lake Michigan by the Calumet. Père Marquette spent the winter of 1674-5 in a cabin on the south branch of the Chicago River, being unable on account of physical weakness to prosecute his journey to the Illinois villages. It was in the following springtime that the devoted missionary died, while endeavoring to make his way to Mackinac, by the east shore of Lake Michigan.

The French seem later to have had a fort at the Chicago portage, although it was probably a mere stockade, and no regular garrison was kept in it. This fort is mentioned by James Logan in his report to the governor of Pennsylvania in 1718, and also in the treaty of Greenville, 1795. However, the Chicago portage was not much used by the French, as they found other routes of travel safer and more convenient.

About the time of the Revolutionary War a colored man from San Domingo, Jean Baptiste Point de Saible (or au Sable), made his way to the Chicago River and established himself there as an Indian trader. Here, about 1777, he built a house of squared logs which may be regarded as the beginning of continuous settlement at Chicago. This house he sold in 1796 to a French trader, who in turn sold it in 1803 to John Kinzie, the first American settler. The house, known as the old Kinzie mansion, stood on the north bank of the river opposite the site on which Fort Dearborn was later built, and was in existence until 1837.

Kinzie was an Indian trader, and no doubt thought the Chicago a convenient centre for his business. He brought his family to his new home in 1804, the same year in which the fort was built, and thereafter continued his residence there until his death (1828).

Fort Dearborn was a mere stockade, with two blockhouses. The quarters for the garrison were enclosed in the stockade. It was situated on the south bank of the river, not far from the lake. At that time the river took a sharp turn to the south just east of the fort, and made its way into the lake over a heavy sandbar not far from what is now the eastern end of Madison Street. The bar was not capable of being crossed by anything larger than a small boat, and the schooner which, in 1804, brought the stores for the garrison had to anchor and

land passengers and cargo in boats. The first garrison consisted of one company of infantry (of the First regiment). The site of the fort was on a reservation of six square miles, set aside from the United States in Wayne's treaty with the Indians made at Greenville in 1795.

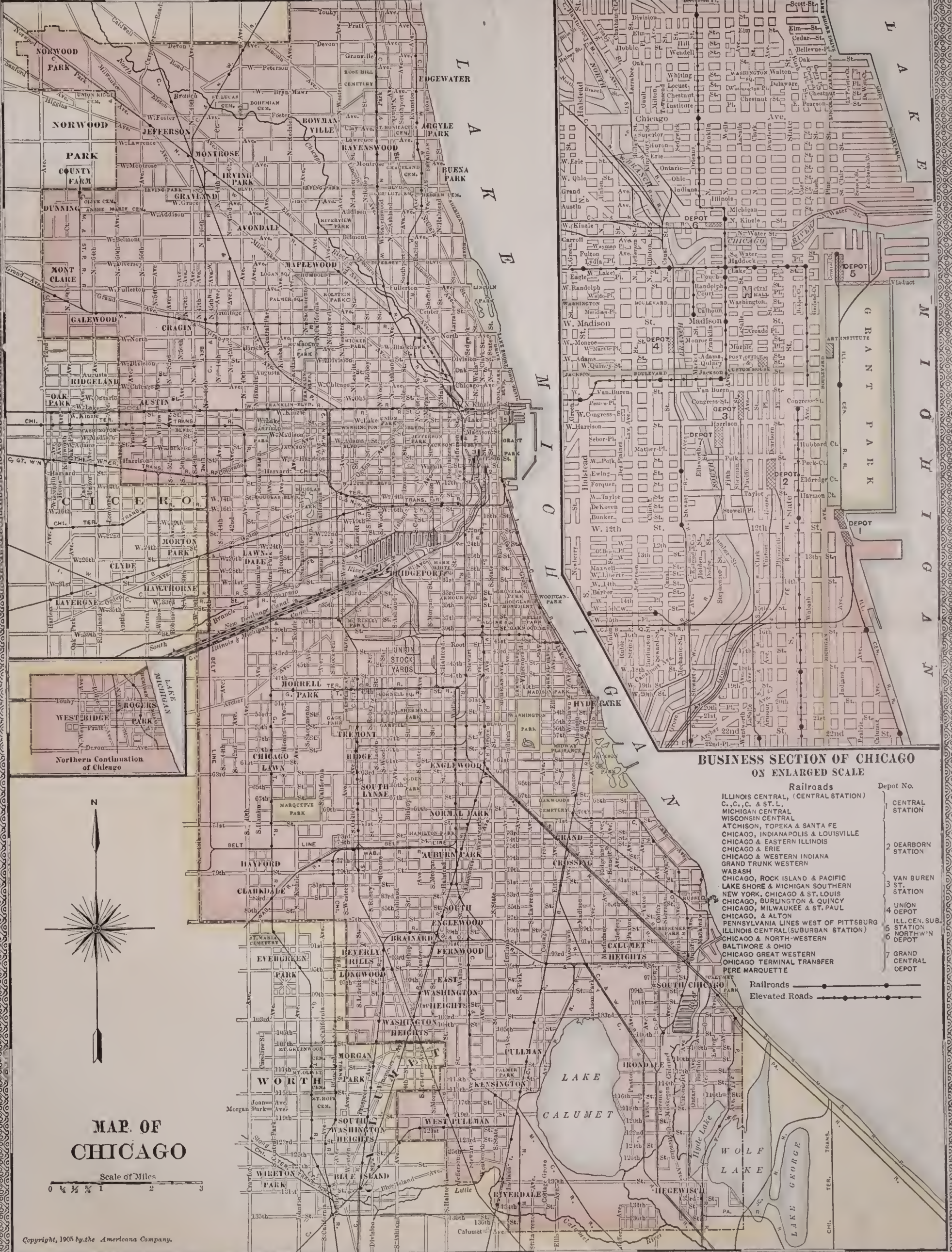
The settlement at Fort Dearborn made little growth until after the War of 1812. It was far in the wilderness, being reached from Detroit by a trail through the woods, and from Mackinac by lake schooners of which usually two came each year, in spring and fall.

The Massacre of 1812.—In 1812 the second war with Great Britain broke out, and at the outset in the northwest all the advantage lay with the British and their Indian allies. Mackinac was captured, thus securing to the British the control of the upper lakes, and Gen. Hull, in command at Detroit, sent orders that Fort Dearborn should be evacuated, and that the surplus stores should be divided among the Indians. These orders were executed, and on 15 August the garrison, escorting a number of women and children, set out for Detroit by the road which wound along the lake shore. At a point among the sand hills near the eastern end of the present Eighteenth Street the savages attacked in force, and the whole body of whites were captured or destroyed. Two of the women and twelve children were butchered during the fight, and a number of the wounded men were killed afterward. The Indians then burned the fort and divided the plunder.

In 1816, after peace was fully restored, Fort Dearborn was reconstructed on a somewhat larger scale than before, and under protection of its garrison a small village slowly grew up.

Political Jurisdictions.—In the old days of French and British occupation the territory, including the valleys of the Wabash and Illinois rivers, west to the Mississippi and north to Lake Michigan, was commonly known as the "Illinois Country." The main French settlements were at Vincennes, on the Wabash, at Kaskaskia on the river of that name, and at Cahokia and Fort Chartres, on the Mississippi. In 1763, by the Treaty of Paris, the French government yielded to Great Britain all claim to land east of the Mississippi, and thus the Illinois Country became British. By the "Quebec Act" of 1774—one of the legislative acts of the British government which led to the Revolutionary War—all of the newly acquired land between the Ohio and the Great Lakes was included in the province of Quebec, thus placing it under the arbitrary military government at that time prevailing over Canada.

In 1778 a small army of Virginia troops sent out by Gov. Patrick Henry, under command of Col. George Rogers Clark, seized Kaskaskia and Vincennes, and thus replaced British authority by American throughout the Illinois Country. The treaty of peace of 1783 drew the northern line of the new republic through the Great Lakes, instead of through the Ohio River, as doubtless would have been done had it not been for Clark's victorious expedition, and thus the site of Chicago became finally American and not British. Virginia organized the Illinois Country as a county—the County of Illinois—and under that government it continued from 1778 until the cession of all the northwest by Virginia to the United States, in 1783.



**BUSINESS SECTION OF CHICAGO
ON ENLARGED SCALE**

Railroads	Depot No.
ILLINOIS CENTRAL, (CENTRAL STATION)	1 CENTRAL STATION
C. & C. & ST. L.	
MICHIGAN CENTRAL	
WISCONSIN CENTRAL	
ATCHISON, TOPEKA & SANTA FE	
CHICAGO, INDIANAPOLIS & LOUISVILLE	
CHICAGO & EASTERN ILLINOIS	
CHICAGO & ERIE	2 DEARBORN STATION
CHICAGO & WESTERN INDIANA	
GRAND TRUNK WESTERN	
WABASH	
CHICAGO, ROCK ISLAND & PACIFIC	3 VAN BUREN ST. STATION
LAKE SHORE & MICHIGAN SOUTHERN	
NEW YORK, CHICAGO & ST. LOUIS	
CHICAGO, BURLINGTON & QUINCY	4 UNION DEPOT
CHICAGO, MILWAUKEE & ST. PAUL	
CHICAGO, & ALTON	
PENNSYLVANIA LINES WEST OF PITTSBURG	5 ILL. CEN. SUB. STATION
ILLINOIS CENTRAL (SUBURBAN STATION)	6 NORTH W. N. DEPOT
CHICAGO & NORTH-WESTERN	
BALTIMORE & OHIO	7 GRAND CENTRAL DEPOT
CHICAGO GREAT WESTERN	
OHIO TERMINAL TRANSFER	
PERE MARQUETTE	

Railroads ———
Elevated Roads ———

**MAP OF
CHICAGO**

Scale of Miles
0 1/4 1/2 1 2 3

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CHICAGO

While Clark's expedition determined the exclusion of British authority from the Illinois Country, there remained a dispute as to jurisdiction over it among several of the States. Virginia claimed all the territory between the Ohio, the Mississippi and the lakes, on the ground mainly of conquest. New York claimed the same territory, on the ground of a treaty with the Iroquois, who were asserted to have extended their conquests as far as the Mississippi. Massachusetts and Connecticut claimed, under their original charters, to own all the land between their northern and southern boundary lines of latitude west of New York as far as the Mississippi. Under these various claims Chicago is in territory claimed respectively by Virginia, New York, and Connecticut. The conflicts were settled by acts of cession on the part of the various States to the United States.

After the Virginia act of cession of 1783, the authority of that State was withdrawn from the Illinois Country, and for several years the French villagers were a law unto themselves. In 1787, however, the ordinance for the government of the Northwest Territory was enacted by Congress, and thus the Chicago area came legally into that territory. In 1790 Gov. St. Clair visited Kaskaskia and formed St. Clair County from the southwestern portion of the Illinois Country. The wilderness north of that had practically no white population, and hence no local government was needed. In 1796, however, the County of Wayne was organized, which included Detroit and the Chicago area. It was in this year that the British finally withdrew their garrisons from Detroit, and the new county was named from the victor over the Indians in the campaign of 1794, who also made the Treaty of Greenville in 1795. In 1800 the Indian Territory was organized, in which all the Illinois Country was included, and in 1809 the Illinois Territory was created, including all west of the Wabash River and north to British America. When the boundaries of Wayne County were changed, in 1803, the Chicago area was left out, and it was not included within any county until 1812, when the county of Madison was formed. Under the law of the Territory of Illinois, Chicago was included in Edwards County in 1814, and in Crawford County in 1816. In 1818 Illinois was admitted to the Union as a State. Under the laws of the State Chicago was successively included in Clark County, organized in 1819; in Pike County, 1821; in Fulton County, 1823; in Peoria County, 1825; and finally in Cook County, organized 15 Jan. 1831.

The ordinance of 1787 seemed to indicate that a State in the northern part of the Northwest Territory west of Lake Michigan should have as its southern boundary a line drawn east and west through the southern extremity of that lake, and the bill for the admission of Illinois was originally drawn accordingly. Mr. Nathaniel Pope, delegate in Congress from the territory, however, succeeded in having the bill amended so as to secure the present northern boundary for Illinois. Had this not been done, Chicago would be in the State of Wisconsin.

Origin of the City.—In 1830 Chicago was a hamlet of log houses inhabited by something less than a hundred people. These log houses were nearly all on the North and West sides. The beginning of the city as a prosperous town was due to the Illinois and Michigan canal,

authorized by act of Congress in 1827. By this act the State was granted alternate sections of land on both sides of the canal route, and the canal commissioners proceeded to lay out towns and sell lots in order to secure funds. One of these towns was Chicago, at the eastern terminus of the canal, and the lands platted therein were sold in 1830. The town was bounded on the east by State Street, on the north by Kinzie Street, on the west by Desplains Street, and on the south by Madison Street. Buildings began to be erected and slowly immigration began to come. The early settlement of Illinois had been in its southern counties and was derived mostly from southern States. The new migration, beginning with 1830, came in the main by way of the lakes and was largely from the East, New York and New England being especially represented. In 1833 Congress made an appropriation for a harbor at Chicago. Piers were built out into the lake, a channel was cut through the old sandbar, and the spring freshets sufficed to scour it out. It was in 1834 that, for the first time, a schooner sailed up the river. By 1837 the town had grown to have a population of 4,170, and in that year it was incorporated as a city.

Railroads.—The canal, from which so much was expected, did not prove the wonderful success that was hoped. It was not finished till 1848. Meanwhile, however, railroad construction began and effectively opened up the prairie interior of the State, while the application of steam to navigation made it comparatively easy to transport passengers and freight between Chicago and Buffalo. In 1852 the Michigan Southern and the Michigan Central railways reached Chicago, and others speedily followed in all directions.

Population and Area.—The growth of the new city in population, slow at first, finally became very great. The area was extended also by successive annexations of contiguous territory. The 4,170 people of 1837 became 4,479 in 1840, 28,269 in 1850, 109,206 in 1860, 306,605 in 1870, 503,298 in 1880, 1,105,540 in 1890, and 1,698,575 in 1900. The city area in 1837 was 2.55 square miles. In 1900 the area was 190.638 square miles.

The Great Fire of 1871.—The year 1871 was memorable for the great fire which swept a large part of Chicago from the earth. Beginning at a little before nine o'clock on Sunday evening, 8 October, in a small barn on the West Side, the flames spread through all the three sections of the city, and were not finally extinguished until Monday night, 9 October, at ten o'clock, when a welcome rain fell. The main business and residence portion of the city was devastated. The total area of the burnt district was 2,024 acres, nearly three and a third square miles, and the value of the property destroyed was estimated at \$187,000,000. The loss of life can only be conjectured—perhaps it amounted to 300 persons. The destitution which for a time fell upon the city was relieved with lavish generosity from all parts of this country and of Europe.

This appalling disaster did not daunt the people of Chicago. They began at once to rebuild the city and to reconstruct business. While many insurance companies were obliged to suspend, still some \$46,000,000 were realized from this source, and fortunately the bank vaults in every instance but one were found to have preserved their contents intact. Within two

CHICAGO

years the burnt area was again covered with buildings, and of a more solid type than before the fire.

The Columbian Exposition.—In 1892-3 a World's Fair was held in Chicago, to commemorate the discovery of America four centuries before. An act of Congress, passed in the spring of 1890, authorized an international exposition in Chicago as an illustration of the development of the new world which Columbus found, made appropriations for the share of the United States government, and provided for a national commission to supervise the work. In Chicago a corporation was formed under the laws of Illinois, to undertake the practical details. Funds were provided from private subscriptions to the stock of the exposition company, from a loan of \$5,000,000 made by the city, the proceeds of which were devoted to the exposition, from a special appropriation by Congress, from gate receipts, and from various concessions. The site was Jackson Park and the Midway Plaisance, an area of 666 acres being included, with a frontage of two miles on Lake Michigan. Buildings were erected on an elaborate scale, and with taste which met wide approval. The great building devoted to manufactures had a ground area of nearly 31 acres, and a floor and gallery space of 44 acres. In the central hall 75,000 people could be seated, while the entire building would seat 300,000. The standing army of Russia might have been drawn up under its roof. The entire cost of the fair was estimated at upward of \$43,000,000. The number of paid admissions throughout the six months from May to November was 21,500,000, the whole number of admissions being 27,529,401.

Chicago and the Federal Government.—In Chicago are held United States courts as follows: The Circuit Court of Appeals, and the Circuit Court of the seventh judicial circuit, and the District Court of the northern district of Illinois. Pending the erection of the new United States federal building, now nearing completion, the courts are held in leased rooms.

The Chicago post-office includes the central office, 47 carrier stations, 4 stations without carriers, and 200 sub-stations. There are 1,633 clerks in the main office and stations, and 1,400 carriers and collectors. The receipts for the year 1902 were \$9,175,895.88. During the same period the pieces of mail handled numbered 457,382,116 first-class, and 216,901,206 second-class, of 49,090 tons weight.

By the apportionment under the census of 1900 Illinois has 25 representatives in Congress. Six of the Illinois congressional districts lie wholly in Chicago, and four more are partly in Chicago.

The port of Chicago showed vessels entered for the year 1902, to be 8,083, with a tonnage of 7,179,053, while the number cleared for the same period was 8,164, with a tonnage of 7,229,342. The receipts of the Chicago custom-house for 1902 were \$6,339,889.45. The internal revenue collections for the same period were \$8,876,909.33.

Chicago and the Government of Illinois.—The General Assembly of the State of Illinois numbers 51 senators and 153 representatives, one senator and three representatives being elected from each district. Of these districts 14 are wholly and 4 are partly in the city of Chicago.

The Supreme Court of Illinois consists of seven judges elected one in each of seven districts for a term of nine years. Chicago is in the seventh judicial district. The five counties composing that district had in 1900 a total population of 2,013,353, of which Chicago had 1,698,575.

Cook County forms a judicial circuit of the State, and has (in 1903) a Superior Court of 12 members and a Circuit Court of 14 members. These courts have concurrent jurisdiction in law and equity. The members are elected for a term of six years by the voters of the county. The population of Cook County in 1900 was 1,838,735, of whom 1,698,575 were in Chicago.

Three judges of the above courts are designated by the Supreme Court of the State to sit as an appellate court, with appellate jurisdiction over the circuit, superior, and county courts. In like manner three other judges are designated by the same authority to form a branch appellate court.

The Criminal Court of Cook County is formed by judges of the Circuit and Superior courts, who alternate in the duty of holding such court. Cook County also has a County Court and a Probate Court, each consisting of one judge, elected by the people of the county, for a term of four years. All these courts sit in the city of Chicago.

As has been noted, Chicago contains 1,698,575 of the 1,838,735 people of Cook County, or 92.4 per cent. The taxable value of property in Cook County, which, by State law, is one fifth of the assessed full real value, is \$433,487,627. The taxable value of property in Chicago is \$402,482,319, or 92.8 per cent of that of the county. Moreover, many of the people residing in Cook County outside the limits of Chicago, have their business in the city. From these facts it is plain that Cook County is largely identical with Chicago.

The affairs of the county are administered by a county board of 15 members, elected for a term of three years. Ten are elected in the city and five from that part of the county outside the city. The president of the board is designated by the people at the election for commissioners.

The administrative officers of the county are a treasurer, clerk, sheriff, coroner, recorder, superintendent of schools, State's attorney, county attorney, a civil service commission, a jury commission, a board of assessors, a board of review, and some other officials of minor functions. The county maintains an insane asylum and poor-house, and a county hospital (the last-named being in the city). As the city has no hospital, except one for contagious diseases, the county hospital practically takes the place. Chicago is the county-seat, and hence all the county officials above named have their offices in the city. The administrative officers are in the main elective.

The City Government.—The city is incorporated under the general laws of the State for municipal corporations. The constitution of Illinois forbids special charters for corporations, and the statutes provide in detail a scheme of government for cities.

Local legislation and general administrative oversight are vested in the common council. Each of the 35 wards elects two members, for a

CHICAGO.



1. Newberry Library.

2. Auditorium and Annex.

CHICAGO

term of two years. One half of the council are chosen each spring. The mayor presides over the council.

The mayor is the administrative head of the city. He is chosen by popular election, also for a term of two years. He has the veto power over all acts of the council, and exerts directive control over the administrative departments. The mayor appoints the heads of departments, subject to the approval of the council. Heads of departments appoint their subordinates, subject to the approval of the mayor. The city treasurer, city clerk, and city attorney are elected by the people. The main administrative departments are those of finance, law, public works, police, fire, health, and education. The departments of health and education are under boards. The others have a single head.

The city budget is made annually by the common council, and the same body levies a tax to meet a great part of the expenses. Water rates provide the cost of water supply, and there is a considerable income from licenses. The sanitary board and the three park boards are permitted by law to levy taxes for their own purposes.

The board of education forms, strictly speaking, a department of the city government. The 21 members are appointed by the mayor, subject to the approval of the common council. Seven are appointed each year for a term of three years. The board, with the common council, levies an annual tax on city property. Such tax may not exceed two per cent on the assessed value of property. The city school tax for the year 1902 yielded \$7,397,860.60. Besides this the city school fund received during the same year \$331,833.86 from the State, \$512,596.41 from interest on investments, and \$82,455.94 from miscellaneous sources. The total income of the school board for 1892 amounted to \$8,395,791.06.

The public schools offer free education through all grades up to and through the high schools, and the law makes elementary education compulsory. There are 15 high schools, with 356 teachers and an enrollment of 10,920 pupils. There are 235 elementary schools, with 5,021 teachers and 257,472 pupils. Students finishing the high school course are prepared to enter college. There is also a city normal school, with 74 teachers and 521 students, and there are 327 special teachers. The grounds, buildings, and equipments of the schools represent an investment of \$34,474,311.33.

The Park System.—The parks of Chicago are under control of three boards, one for each of the three sections of the city. These boards are created under State law, and they are independent of the city government. The members of the Lincoln Park Board, on the North Side, and those of the West Park Board, are appointed by the governor of the State. The members of the South Park Board are appointed by the judges within Cook County. Each park board levies taxes on the property within its park district. The park system forms a girdle around the city, from Lincoln Park, on the lake shore at the north, to Jackson Park, on the lake shore at the south. The various parks are connected by a series of boulevards. The total area of parks and boulevards is 2,111.494 acres (1902). On the lake front between Randolph and Twelfth streets a park is being formed by

filling in the submerged land to a distance of 1,200 feet from the existing shore line. This will result in a lakeside park of 203 acres, which is to contain the Field Columbian Museum, as well as the Art Gallery of the Chicago Art Institute. The shore line of this park will be a mile and a quarter. Funds for the parks are obtained by taxes levied by the boards on their respective districts, and by the sale of a limited amount of bonds. By a statute of 1903 park loans to the amount of \$5,000,000 were authorized, and in consequence the total park area will presently be doubled.

The Chicago Sanitary District.—The Chicago Sanitary District was authorized by act of the State legislature in 1889, ratified by vote of the people in the same year, and organized in 1890. The water supply of the city is taken from the lake, being pumped into the mains from a series of stations at varying distances from the shore. The city drainage also was of necessity carried into the lake, either directly or by way of the river. Contamination of the water supply it was hoped to avoid by carrying the pumping stations farther into the lake than it was supposed the sewage outflow would go without purification by air and sun. As the city grew, however, it became manifest that the lake water was dangerous to health, and in the end the plan was devised of cutting a canal between the south branch of the Chicago River and the Desplaines River, with a pumping plant capable of turning the water of the south branch into the canal. Then, by connecting all the sewers with the river, it was intended to convert the city drainage into the Desplaines. As all parts of the city could not be included in the new drainage area, and also as a great part of that area must be outside the city limits, a drainage district was created, known as the Chicago Sanitary District. The construction and management of the canal within that district was entrusted to a board of nine commissioners, elected by the people. Funds were provided by bonds of the district and by taxation. The bonds amount to \$14,005,000. The total cost of the work has been nearly \$40,000,000. Earth was broken 3 Sept. 1892, and the water of the lake was turned into the canal 2 Jan. 1900. Since that date it may be noted that the Chicago River no longer flows into Lake Michigan. Its waters now reach the Mississippi. The Sanitary District as originally created comprised all of Chicago north of Eighty-seventh Street, and some 43 square miles of Cook County outside of Chicago. The assessed value of taxable property in the district is \$393,080,042, of which \$387,204,282 belong to that portion within the city—a percentage of 98.5. By law the board was authorized to effect loans to the amount of five per cent of the value of the taxable property in the district, provided that the total should not exceed \$15,000,000. The tax levy of the district must not exceed one half of one per cent of the assessed value of taxable property in the district.

By a statute of 1903 large additions of territory will be made to the Sanitary District, so as to protect the lake water both north and south of the original area.

The main channel of the canal, from river to river, is 28.5 miles long. The width on the bottom varies from 110 feet to 202 feet, and on the top from 198 feet to 290 feet. The mini-

CHICAGO

mum depth of water is 22 feet. It is evident that in the drainage canal is the beginning of a navigable waterway from Lake Michigan to the Mississippi River—including, indeed perhaps two thirds of the work and cost of such waterway.

Public Works.—The city department of public works has charge of the paving, repair, and cleaning of streets and alleys, of the construction and maintenance of sewers, and of the city waterworks. There were in the city 31 Dec. 1902, 2,798.34 miles of streets and 1,375 miles of alleys—a total of 4,173.34 miles. Of these 1,373.01 miles were paved. This is exclusive of the parkways and boulevards under the care of the various park boards, in which there are 101.250 miles of improved driveways. The total mileage of sewers, 1 Jan. 1903, was 5,527.05. Intercepting sewers are now under process of construction for the purpose of diverting the flow of sewage from the lake into the drainage canal.

The pumping stations provided the city during the year 1902 with 130,892,288,020 gallons of water. The mileage of water pipe in use was 1,918.74. Water rates were collected to the amount of \$3,225,317.43—an amount sufficient to cover the cost of the supply.

The City Library.—The Chicago Public Library contains 282,925 volumes. The main library building, on Michigan Avenue between Randolph and Washington streets, is valued at \$2,055,550. The income of the Library Board (the members of which are appointed by the mayor), was for 1902, \$284,098.08. Of this sum \$273,696.69 were derived from taxation, and the remainder from miscellaneous sources. The library maintains branch reading rooms and delivery stations in different parts of the city. The T. B. Blackstone Memorial Branch Library, an Ionic building of granite and marble, with shelving capacity for 25,000 books, is nearing completion, the gift to the city of Mrs. T. B. Blackstone.

The City Corporate.—The city corporate, that is, the city exclusive of the Sanitary and Park corporations and the school board, had a total public revenue for 1902 of \$11,055,391.78. Of this sum \$5,770,876.97 were derived from taxation, \$3,770,735.37 from licenses. The public debt of the city corporate was 31 Dec. 1902, \$15,123,000. There were also at that time outstanding water certificates to the amount of \$1,000,000.

Institutions of Private Endowment.—The public spirit of Chicago citizens is manifest in many institutions endowed by private munificence for the public good.

The Chicago Art Institute is devoted to maintaining an art gallery and to conducting education in art and architecture. The enrollment of students for 1902-3 was 2,580. The Ryerson Library of Art, a beautiful wing of the main building, contains about 3,000 volumes.

The Newberry Library, on the North Side, has an endowment of \$2,500,000, and occupies a building valued at \$500,000. The library, used wholly for consultation, has 260,773 books and pamphlets.

The John Crerar Library, on the South Side, has an endowment of \$3,400,000. The books, which are confined to branches of science, number 89,219.

The library of the Chicago Law Institute,

which has quarters in the County Court-house, numbers 39,830 volumes.

The library of the University of Chicago contains 365,000 volumes.

Higher education is represented by the University of Chicago, by the professional schools of Northwestern University, by the medical schools of the University of Illinois, by the Armour Institute and the Lewis Institute, and by various independent schools of law and medicine.

The University of Chicago (q.v.) opened its doors for instruction in 1892. The buildings are situated on the South Side, fronting on the Midway Plaisance, one of the south parkways. Its assets amount to \$17,348,000. The enrollment of students in 1902-3 numbered 4,463. The university consists of colleges of arts, literature, and science, a divinity school, a law school, a medical school, a professional school for teachers, and of various other activities, including a press department, which publishes both books and periodicals.

Northwestern University maintains in the city its schools of law, medicine, pharmacy, and dentistry. The college of liberal arts and the school of music are at Evanston. The entire endowment of the university, including grounds and buildings, amounts to \$6,000,000. The total number of students in all departments (1902-3) was 2,731.

The University of Illinois (located at Urbana, Champaign County) has its schools of medicine, dentistry, and pharmacy in Chicago. There were in 1902-3 in these schools 1,039 students.

The Lewis Institute is a polytechnic school, on the West Side. It was opened for instruction in 1895, the endowment at that time amounting to \$1,600,000. The enrollment of students for 1902-3 included 1,143 in the day classes and 1,362 in the night classes.

The Armour Institute, on the South Side, is also a polytechnic school. The endowment amounts to \$4,500,000, and the enrollment of students, 1902-3, was 1,300.

The Field Columbian Museum (q.v.) is an outcome of the Exposition of 1893. The museum was incorporated in that year, and was at the outset enriched by many of the most valuable exhibits which had been made at the Exposition. The original endowment of \$1,250,000 was the gift in large part of one citizen. Large acquisitions have been made, especially in the fields of American ethnology. The collections are at present housed in one of the remaining Exposition buildings, in Jackson Park. Plans are on foot for more adequate provision in the near future. In 1900-1 there were 4,196 students enrolled in the schools of law, medicine, and theology situated in Chicago.

There are 52 hospitals in the city, including the Cook County hospital. Many of these are liberally endowed. There are also 33 free medical dispensaries, 59 asylums, including the Cook County Insane Asylum and the county poor-house, both of which are situated at Dunning, outside the city limits.

Churches.—Religious organizations number some 919 churches and missions. Of these the most numerous are the 70 churches and 14 missions of the Baptists, the 79 churches and 20 missions of the Congregationalists, the 47 churches and 6 missions of the Episcopalians,

CHICAGO.



1. University of Chicago Buildings.

2. Lake Drive, Lincoln Park.

CHICAGO & ALTON RY.—CHICAGO, BURLINGTON, & QUINCY RY.

the 34 Jewish congregations, the 93 Methodist Episcopal, 69 Lutheran, 56 German Protestant, and 135 Roman Catholic.

Business.—Manufactures and commerce form the basis of Chicago's prosperity. With the development of the West and the extension of railroads the industries of the city have grown to enormous magnitude. The manufactures of iron and steel in South Chicago, the agricultural implement works, and the beef and pork packing, are among the largest. The receipts of live cattle at the Union Stock Yards in 1902 were 2,941,559, of sheep 4,515,716, and of hogs 7,895,238. By far the greater part of these were either consumed in the city or packed and sold abroad. The Chicago elevator warehouses have a capacity of 30,470,000 bushels of grain. The total clearings in the associated banks of Chicago for 1902 were \$8,394,872,351.59, and the total balances were \$653,199,396.54. The national banks in the city had (25 Nov. 1902) a total capital stock of \$24,900,000, and total deposits of \$265,136,636. State banks showed (22 Dec. 1902) total deposits of \$215,413,008.

The census of 1900 records 19,203 manufacturing establishments. Chicago, with a capital of \$534,000,689, an average number of 262,621 wage earners, total wages amounting to \$131,065,337, and a product valued at \$888,945,311. New York by the same census shows 39,776 establishments, with a capital of \$921,876,081, and a product of \$1,371,358,468. The third manufacturing city in the Union is Philadelphia, with 15,887 establishments, a capital of \$476,529,407, and a product valued at \$603,466,526.

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HARRY PRATT JUDSON.

Chicago and Alton Railway, a system operated in Illinois and Missouri by a company of the same name, incorporated 2 April 1900. The company purchased the property of the St. Louis, Peoria and Northern Railway Company and also acquired over 98 per cent of the capital stock of the Chicago and Alton Railroad Company, whence its title. The Chicago and Alton Railroad Company, operating under a charter of the State of Illinois, dated 30 Nov. 1859, was originally the Alton and Sangamon Railroad Company, afterwards known as the Chicago and Mississippi Railroad Company. The new company on 3 April 1900 leased for a term of 99 years the Chicago and Alton Railroad with its leased lines, and agreed to pay as rental, the interest on the bonds of the Chicago and Alton Railroad Company, the rentals payable by the Chicago and Alton Railroad Company under the leases of the Joliet and Chicago Railroad, Kansas City, Saint Louis and Chicago Railroad, and Louisiana and Missouri River Railroad, taxes and the surplus net earn-

ings of the leased properties. On 16 Dec. 1902 the company was admitted as a member of the Terminal Railroad Association of Saint Louis, and became the owner of one-fourteenth of the capital stock of the Terminal Company. For the fiscal year ending 30 June 1905, the company operated 915.23 miles of track; of this it owned the Springfield to Grove, Ill. line, 53.56 miles; it leased the Chicago and Alton Railroad, 547.53 miles; the Joliet and Chicago Railroad, 37.20 miles; the Kansas City, Saint Louis and Chicago Railroad, 161.97 miles; the Louisiana and Missouri River Railroad, 101.68 miles; had 17.37 miles of trackage rights on the Toledo, Peoria and Western Railway, the Peoria and Pekin Union Railway, the Hannibal and Saint Joseph Railroad; and in addition operated jointly with the Cleveland, Cincinnati, Chicago and Saint Louis Railway Company, the line between Wann and East Saint Louis, 17.85 miles. The system also comprised 107.52 miles of second track, 320.91 miles of sidings, giving a total length of all tracks, 1,343.66 miles. The operating divisions of the system exclusive of trackage rights are: Springfield, Ill., to Grove, Ill., 53.56 miles; Chicago, Ill., to East Saint Louis, Ill., 279.95 miles; Coal City Line, Joliet, Ill., to Mazonia, Ill., 24.79 miles; Dwight, Ill., to Washington and Lacon, Ill., 80.10 miles; Roodhouse, Ill., to Kansas City, Mo., 251.17 miles; Bloomington, Ill., to Godfrey, Ill., 150.83 miles; Godfrey, Ill., to Wann, Ill., 7.36 miles; Mexico, Mo., to Cedar City, Mo., 50.10 miles. The equipment of the system comprised 221 locomotives; 210 passenger cars; 9,381 freight cars; 353 road service cars. The number of passengers carried in the year was 3,286,969, an increase of 119,358, or 3.77 per cent over 1904, largely due to increased travel to and from the Louisiana Purchase Exposition at Saint Louis. 6,090,663 tons of revenue freight were carried, a decrease of 30,670 tons or .50 per cent; but, on account of an increase in the average rate obtained, there was a gain of \$124,194.81, the total freight revenue amounting to \$611,144.82. The total earnings of the year amounted to \$11,797,313; operating expenses \$7,602,662 yielding net earnings \$4,194,651. Other income of \$1,794,138 gave a total net income of \$5,988,789. The total payments came to \$5,837,382, leaving a surplus of \$151,407. The authorized capital stock of the company is \$40,000,000, consisting of \$20,000,000 preferred stock and \$20,000,000 common stock, shares \$100 each, of this amount \$39,086,800 have been paid in.

Chicago, Burlington and Quincy Railway, popularly known as the "Burlington Route," a system operating in Illinois, Wisconsin, Minnesota, Iowa, Missouri, Nebraska, Kansas, Colorado, Wyoming, South Dakota, and Montana. The nucleus of the system originated in the Aurora Branch Railroad Company, chartered 12 Feb. 1869, a name changed to Chicago and Aurora Railroad Company, 22 June 1852, and to the present corporate title 14 Feb. 1855. The earliest constructed portions of the system were the section of the main line from Chicago to Mendota, Ill., 76.89 miles, and the branch from Aurora to West Chicago, Ill., 12.35 miles. By construction, consolidation, and purchase the system has gradually enlarged until it was leased 1 Oct. 1901 for 99 years, by the present

CHICAGO DRAINAGE CANAL

Chicago, Burlington and Quincy Railway Company, incorporated in Iowa, 16 Oct. 1901. The terms of the lease were a rental amounting to the interest on the funded debt, sinking fund charges, taxes, and dividends at the rate of seven per cent per annum on the capital stock.

The length of road operated and controlled 30 June 1905, was 8,879 miles as against 8,821 miles 30 June 1904; of this mileage 6,066.11 miles were owned absolutely by the company. The mileage is located as follows: 1,567.31 miles in Illinois; 223.10 miles in Wisconsin; 38.45 miles in Minnesota; 1,440.10 miles in Iowa; 1,141.79 miles in Missouri; 2,631.51 miles in Nebraska; 260.44 miles in Kansas; 429.35 miles in Colorado; 199.90 miles in Montana; 278.16 miles in South Dakota, and 351.53 miles in Wyoming. The roads east of the Missouri River totaled 2,904.27 miles, the roads west of the Missouri River 4,136.15 miles. The principal sections are: Main line, Chicago, Ill., to Denver, Col., 1,020.74 miles; Saint Paul and Minneapolis Line, 407.18 miles; Saint Louis and Burlington Line, 217.16 miles; Hannibal and Saint Joseph Line, 206.52 miles; Kansas City and Omaha Line, 195.33 miles; Nebraska and Montana Line, 837.41 miles; Cheyenne Line, 471.91 miles; other divisions and branches, 5,021.95 miles; all operated as the Chicago, Burlington & Quincy Railroad. The company also owns and controls the Quincy, Omaha and Kansas City Railroad, with the Gower Branch 262 miles, the Jacksonville and Saint Louis Railway with the Concord Branch, 122.93 miles; and has a total of 203.09 miles of leased trackage rights.

The equipment of the company 30 June 1905 comprised 1,343 locomotives, 1,128 passenger cars, 48,414 freight cars, 6,399 miscellaneous cars; total of cars and locomotives, 57,284. The total earnings for the year were \$65,973,045, the operating expenses \$44,100,331, leaving net earnings \$21,872,714; other income of \$302,202 made a total net income of \$22,176,916. The total payments amounted to \$17,204,989, giving a surplus of \$4,969,927. 14,929,079 passengers, and 27,428,482 tons of freight were carried. The capital stock of the company is \$110,839,100; the funded debt standing at \$171,015,100 was reduced to \$170,512,100 during the year.

Chicago Drainage Canal, a canal intended chiefly for carrying off the sewage of Chicago, but which may be used for commercial purposes. It was begun in September 1892, and was completed in January 1900. The main channel is 29 miles long, extending from Chicago to Lockport on the Illinois River, into which stream it discharges. The cost of the canal was about \$45,000,000. See CANALS.

Chicago, Great Western Railway, popularly known as the "Maple Leaf Route," a system operating in Illinois, Iowa, Minnesota, Missouri, Kansas, and Nebraska. The company was chartered 5 Jan. 1892 under the laws of the State of Illinois for the purpose of reorganizing on a stock basis, the Chicago, Saint Paul, and Kansas City Railway Company. For the fiscal year ending 30 June 1905, the company operated 818.36 miles of railway, a decrease from the preceding year of 55.58 miles which were operated by the Mason City and Fort Dodge Railroad Company, a proprietary line controlling in 1905, 386.25 miles, the stock of which is owned and

held in the treasury of the Chicago, Great Western Railway Company.

The company also owns all the stock of the Wisconsin, Minnesota and Pacific Railroad Company, operating in 1905, 271 miles of railway. The earnings and expenses of each line are kept separate.

Of the mileage operated by the Chicago, Great Western Railway Company in 1905, it owned 756.97 miles, and leased 83.33 miles. The three main lines are: Chicago to Saint Paul via Oelwein, 401.59 miles; Oelwein to Saint Joseph, via Des Moines, 289.58 miles; Bee Creek to Beverly, 23.00 miles: the branch lines were Wilson Junction to Cedar Falls, 7.48 miles; Eden to Mantorville, 7.57 miles, and Sycamore to De Kalb, 5.81 miles. The leased lines were: Saint Paul to Minneapolis, 10.56 miles; Dubuque to Aiken, 14.34 miles; Chicago, 10.18 miles; Des Moines, 2.70 miles; Saint Joseph to Bee Creek, 8.83 miles, and Beverly to Kansas City, 36.72 miles.

The rolling stock consisted of 265 locomotives with a total traction power of 6,243,300 tons; 7,235 freight cars; 148 passenger cars, and 153 miscellaneous cars. The gross receipts from all sources in 1905 were \$7,377,710.54; the operating expenses \$5,123,092.52; taxes \$216,000.00, leaving an income from operation of \$2,038,618.02. Compared with the preceding year both the gross earnings and operating expenses had decreased, the latter in a greater ratio, so that the net earnings were \$16,001.35, or 6.42 per cent better than 1904. In 1905, 2,009,022 passengers were carried as against 1,938,340 in 1904. The number of passengers carried one mile were 82,296,920; the average rate per passenger per mile of road was 2.06 cents. The permanent capital of the company authorized at \$105,000,000 is represented by four classes of stock divided into shares of \$100 each; of this amount \$76,853,724 were outstanding 30 June 1904, leaving \$28,156,876 still issuable. The gross earnings of the Mason City and Fort Dodge Railroad in 1905 was \$1,465,982.88, an increase of \$528,929.33 over 1904; the net earnings were \$481,957.54, showing an increase of \$199,896.24 in the year. The gross earnings of the Wisconsin, Minnesota & Pacific Railroad were \$675,417.64, a decrease of \$2,964.83 in the year; the net earnings were \$305,010.32, an increase of \$31,755.83. While the gross earnings of the entire system decreased \$118,998.79, owing to the large decrease in the earnings of the parent company, the net earnings had increased \$367,653.42. The proprietary lines, being new, have not yet developed their full earning capacity.

Chicago, Indianapolis & Louisville Railway. The company which built the first portion of the Chicago, Indianapolis & Louisville Railway was the New Albany & Salem Railroad Company, chartered 8 July 1847, to build a railway between the points named in its title, a distance of 35 miles. Work was begun in 1849 and the road was completed and opened to traffic in January 1850. Amendments to its charter empowered the company to extend the road to any place within the State, and work was begun on an extension to Michigan City in 1850, and was completed and opened to the public in 1854. The section from Crawfords-

CHICAGO, MILWAUKEE, AND SAINT PAUL RAILWAY

ville to Lafayette was built by the Crawfordsville & Wabash Railroad Company, completed in 1852, and was purchased by the New Albany & Salem Railroad Company.

The company did not prosper and in 1857 it defaulted interest on its bonds, and in 1858 was turned over to D. D. Williamson, of New York, as trustee, and operated by him until October 1868, when a suit for foreclosure was brought and the road went into the hands of a receiver, passing the next year, under foreclosure sale, to the first and second mortgage bondholders, who organized a new company under the name of the Louisville, New Albany & Chicago Railway Company. Various law suits kept the road in the courts for several years from this date, but in May 1881 a consolidation was effected with the Chicago & Indianapolis Air Line Railway.

In January 1882 the Northern extension of the line was completed to a point near Hammond, where a junction was made with the Chicago & Atlantic Railroad, thus giving a line into Chicago. Work was completed on the southern extension to a point four miles north of Indianapolis in October 1882 and, using the tracks of the Lake Erie and Western for these four miles, in May 1883 trains were run through from Chicago to Indianapolis. Subsequently the unfinished portions of the road were completed and the company used its own tracks for the entire distance. In 1889 the company took a thirty years' lease from the Louisville Southern Railroad for its line from Louisville to Burgin, Kentucky, and another for its Lexington Extension. In March 1890, during disputes growing out of the action of newly elected directors of the lessee road, the Louisville Southern Company took possession of both of the leased branches of its road by force, and a very stormy period of litigations followed.

On 1 March 1886 the company bought the Orleans, West Baden & French Lick Springs Railway and completed the construction of its lines within one year. On 1 April 1886, the company bought all of the stock of the Bedford & Bloomfield Railroad Company, amounting to \$600,000. Both of these lines are now merged in the present company.

In June 1879 the Chicago & Western Indiana Railroad Company was organized for the purpose of affording a Chicago terminal to several different companies desirous of entering the city, and the Louisville, New Albany & Chicago became a fifth owner in the concern. In November 1882 the Belt Railway Company of Chicago was formed for the purpose of connecting the various railroad terminals, warehouses, and other facilities in the city. The five companies that formed the Chicago & Western Indiana Railroad Company became the stockholders in this new corporation.

In August 1896, a receiver for the Louisville, New Albany & Chicago Railroad was appointed at the instance of its creditors. In October of that year the consolidated mortgage interest was defaulted, and a reorganization plan was proposed. On 1 July 1897, the purchasing committee under the plan of reorganization delivered the road to a company organized under the name of the Chicago, Indianapolis & Louisville Railway Company. On 15 March 1899, the capital account showed a stock issue of \$5,000,000

preferred and \$10,500,000 common stock, and a bonded debt of \$13,177,000.

In September 1899, the company began the operation of the Indian Stone Railway, extending from Clear Creek to Harrodsburg, a distance of 10 miles, which was constructed under contract with the company in 1898-99.

In May 1902, control of the Chicago, Indianapolis & Louisville Railroad passed to the Louisville & Nashville Railroad Company and the Southern Railway Company, these two companies having acquired fifty-one per cent of the capital shares of the first named company. In September 1902, a contract was entered into with the Illinois Central Railroad Company for the joint use of 10 miles of their road west from Switz City, for a period of 25 years, thus giving the Chicago, Indianapolis & Louisville Railway an entrance into valuable coal fields. A similar contract was made in May 1903, with the Pennsylvania Company for the joint use of that part of its track between Switz City and Gosport Junction.

On 30 June 1905, the company owned 508.85 miles of main track, 214.39 miles of siding, and used under contract 73.44 miles of track, making a total of line operated of 591.51 miles. For the fiscal year ending that date the gross earnings were \$5,609,750.51, and the operating expenses and taxes \$3,630,040.35, leaving a net earning of \$1,979,710.16. The total fixed charges for the year were \$1,025,193.52, and the total surplus, \$1,114,948.92.

The equipment comprised 102 engines, 6,255 freight cars, and 90 cars of all other kinds.

J. A. HILTON,

Secretary.

Chicago, Milwaukee and Saint Paul Railway, a system operated by the company of the same name in Illinois, Wisconsin, Michigan, Minnesota, Iowa, Missouri, South Dakota and North Dakota. The organization was chartered as the Milwaukee and Saint Paul Railway Company, 5 May 1863, the projectors being the purchasers of the foreclosure of the Western Division of the LaCrosse and Milwaukee Railroad. The Milwaukee and Western, the Milwaukee and Horicon, the Ripon and Wolf River railroads, and the Eastern Division of the LaCrosse and Milwaukee Railroad were subsequently acquired by purchase, and under authority of an act of the legislature of the State of Wisconsin, the present name was adopted 14 Feb. 1874, when the total length of completed roads owned, equalled 1,399 miles. During the fiscal year ending 30 June 1905 the company operated 6,911.62 miles of main track, of which 1,725.42 miles were located in Wisconsin; 402.40 miles in Illinois; 1,871.85 miles in Iowa; 1,205.57 miles in Minnesota; 153.31 miles in North Dakota; 1,253.68 miles in South Dakota; 140.27 miles in Missouri; and 159.12 miles in Michigan. The main track owned solely by the company amounted to 6,883.53 miles which with 379.74 miles of second track, 5.57 miles of third track, 1.72 miles of fourth track, 36.28 miles of connection tracks and 1,959.74 miles of yard tracks, sidings and spur tracks, gives a total of 9,266.58 miles owned solely by the company.

Jointly with other companies it owned 28.09 miles of main track, 2.74 miles of second track, 5.26 miles of connection tracks, 75.23 miles of yard tracks, sidings, and spur tracks; total

CHICAGO AND NORTHWESTERN RAILWAY

111.32 miles, and also leased 224.13 miles of main track, 64.84 miles of second track, 1.14 miles of third track, total 290.11 miles, giving a trackage for the entire system of 9,668.01 miles. Extensions from the end of track southeast of Gleason, Wisconsin, 1.55 miles, and from Ladd to Cherry, in Illinois, 3.41 miles were completed at a cost of \$40,495.51, and an extension of the Armour Line, 21 miles in a northwesterly direction, and a line 75 miles long extending west from Chamberlain on the Missouri River, were under construction. The main line of the system from Chicago, Ill., to Minneapolis, Minn., is 417.40 miles in length. The divisions of the system are as follows: Chicago; Evanston; Racine and Southwest Division in Wisconsin and Illinois; Chicago and Council Bluffs Division in Illinois; Chicago and Council Bluffs Division in Iowa; Kansas City Extension; Dubuque Division; Northern Division; River Division; Wabasha Division; Chippewa Valley Division; Iowa and Minnesota Division; Prairie du Chien Division; Mineral Point Division; LaCrosse Division; Wisconsin Valley Railroad; Iowa and Dakota Division; Sioux City and Dakota Division; Southern Minnesota Division; Hastings and Dakota Division; James River Division. The equipment comprises 1,014 locomotives, 467 passenger cars, 78 sleeping cars, 19 parlor cars, 13 dining cars, 3 café observation cars, 2 composite observation cars, 383 baggage, mail, express and combination cars, 41,311 freight cars, 494 caboose cars, 115 wrecking and tool cars, 14 business cars. The narrow gauge equipment comprises 3 locomotives, 3 passenger cars, 5 baggage, mail, express and combination cars, 1 caboose car, 95 freight cars; total equipment, cars and locomotives, 44,020. During 1905 369 cars belonging to the company were destroyed by wreck and fire; three sleeping cars were replaced by new ones, and 291 cars were built during the year for replacement. The number of passengers carried during the year amounted to 10,364,725; 451,490,651 passengers were carried one mile at the average rate per passenger per mile of 2.243 cents. The number of tons of revenue freight carried were 23,303,908; 4,081,408,559 tons of revenue freight were carried one mile at an average rate per ton per mile of .8813 cents. The earnings from passenger traffic during the year were 20.30 per cent of the total earnings, an increase of \$465,326.34 or 4.82 per cent over the previous year.

There was an increase of 2,036,538 tons or 9.58 per cent over the preceding year in the amount of freight carried, the earnings from freight traffic \$35,968,946.47 being 72.11 per cent of total earnings, an increase over the preceding year of \$887,187.19, or 2.53 per cent. The number of tons of all agricultural products carried during the year was 5,266,818 tons—an increase compared with the previous year of 163,636 tons or 3.21 per cent. Agricultural products comprised 22.60 per cent of the total tonnage carried, as compared with 23.99 per cent of the total tonnage of 1904. The number of tons of commodities other than agricultural products carried during the year was 18,037,090 tons—an increase compared with the previous year of 1,872,902 tons, or 11.59 per cent—the per cent of the total being 77.40 per cent against 76.01 per cent in 1904. The gross earnings for the

year ending 30 June 1905 were \$49,884,113, the operating expenses \$32,294,040, yielding net earnings of \$17,590,073; income from other sources \$230,797 gave a total net income of \$17,820,870. The total payments were \$13,435,441, leaving a surplus of \$4,385,429. During the year two dividends aggregating seven per cent were paid on the preferred stock, and two dividends aggregating seven per cent were paid on the common stock, of which the dividends paid 25 Oct. 1904—three and one-half per cent on preferred and three and one-half per cent on common stock were from net earnings of the previous fiscal year, ending 30 June 1904. The total amount of the capital stock of the company at the end of the fiscal year 1905 was \$107,511,300; during the year it had been increased by \$953,000 of preferred stock, issued in exchange for the same amount of convertible bonds canceled. The amount of capital stock per mile of road was \$15,555.15. The funded debt at the close of the fiscal year was \$122,176,500—a decrease in the year of \$928,000. It had been increased during the year by the issue of \$550,000 of General Mortgage Bonds, and had been decreased \$1,483,000 by underlying bonds retired and canceled. The amount of funded debt per mile of road was \$17,676.97, on which the interest charge per mile of road was \$858.24. The total capitalization of the company per mile of road was \$33,232.12.

Chicago & Northwestern Railway, popularly known as "The Northwestern Line," a system operated by a company of the same name in Michigan, Illinois, Iowa, Wisconsin, Nebraska, Minnesota, North Dakota, South Dakota, and Wyoming. The company was organized 6 June 1859 to take over the property of the Chicago, Saint Paul & Fond du Lac Railroad Company, sold under a foreclosure of 2 June 1859. The Chicago, Saint Paul & Fond du Lac Railroad Company had been organized 31 March 1855, to consolidate the Rock River Valley Union Railroad Company with the Illinois & Wisconsin Railroad Company, the latter chartered 12 Feb. 1857 to build a railroad north to the Illinois state line, and to consolidate with any railroad in Wisconsin. The Rock River Valley Union Railroad Company, so named 9 Feb. 1850, was previously the Madison & Beloit Railroad, chartered by the legislature of Wisconsin 19 Aug. 1848; it was leased in 1854 by the Galena & Chicago Union Railroad Company which had been incorporated by the State of Illinois 16 Jan. 1836 to construct a railroad from Chicago to Galena, and lateral lines as they might deem advisable to unite with those of any other railroad company. The Galena & Chicago Union Railroad Company began to build their road in 1847, and their Chicago to Galena section is the earliest built portion of what now constitutes the great Chicago & Northwestern System. The Chicago, Saint Paul & Fond du Lac Railroad Company involved in the great financial panic of 1857, became bankrupt in 1859 and its reorganization as the Chicago & Northwestern Railway Company was authorized by the legislatures of Illinois and Wisconsin. By extensions and by the acquisition of other railroads, chief of these undertakings being the grand consolidation with the Galena & Chicago Union Railroad Company (1864), the Madison Ex-

CHICAGO, ROCK ISLAND, AND PACIFIC RAILWAY COMPANY

tension (1870), the Menomonee Extension (1872), the Elroy Route (1875), the Fort Pierre Extension (1882), the acquisition of the Omaha Road (1882), and of the Fremont, Elkhorn & Missouri Valley Railroad Company (1903); the Chicago & Northwestern Railway Company was operating, 30 June 1905, 7,408.13 miles of railroad. Of this it owned 7,306.61 miles, leased 60.02 miles from the Saint Paul Eastern Grand Trunk Railway, 3.25 miles from the De Pue, Ladd & Eastern Railway, and had 38.25 miles of trackage rights on branches of the Chicago, Saint Paul, Minneapolis & Omaha Railway, the Union Pacific Railroad, the Indiana, Illinois & Iowa Railroad, and the Peoria & Pekin Union Railway. Of the total mileage, 685.02 miles are located in Illinois, 1,778.65 miles in Wisconsin, 521.19 miles in Michigan, 1,577.60 miles in Iowa, 650.30 miles in Minnesota, 948.36 miles in South Dakota, 14.28 miles in North Dakota, 1,102.27 miles in Nebraska, and 130.46 miles in Wyoming. In addition to the above, the company had in operation 846.92 miles of second, third, and fourth main tracks and 2,620.52 miles of sidings and yard tracks, making a total mileage of all tracks, both owned and operated, of 10,875.57 miles. The operating divisions of the system are Wisconsin Division, 324.55 miles; Northern Wisconsin Division, 332.72 miles; Galena Division, 497.98 miles; Iowa Division, 569.46 miles; Iowa and Minnesota Division, 326.75 miles; Northern Iowa Division, 383.57 miles; Sioux City Division, 416.15 miles; Madison Division, 508.10 miles; Ashland Division, 856.32 miles; Peninsula Division, 464.44 miles; Minnesota Division, 499.88 miles; Dakota Division, 802.53 miles; Nebraska & Wyoming Division, 1,429.32 miles. In addition the Chicago & Northwestern Railway Company owns the entire capital stock and all the bonds of the Chicago, Iowa & Dakota Railway Company, a majority of the capital stock of the Chicago, Saint Paul, Minneapolis & Omaha Railway Company, and has contracts and agreements with other railroad companies as follows: With the Chicago, Burlington & Quincy, securing to that company the joint use of the bridge over the Mississippi River at Clinton, Iowa, at an annual rental of \$20,000; with the same company and the Chicago, Rock Island & Pacific, giving them joint use with this company of certain sidings in Council Bluffs, Iowa; with the Chicago, Saint Paul, Minneapolis & Omaha, providing for joint running arrangements between Chicago & Saint Paul, and division of earnings upon a *pro rata* per mile; with the Wisconsin, Minnesota & Pacific, granting that company the joint use of certain tracks and buildings in Zumbrota, Minn., and with the Union Pacific Railroad Company, the Southern Pacific Railroad Company, the Oregon Short Line Railroad Company, and the Oregon Railroad & Navigation Company, providing for the establishment of a through route between Chicago and the Pacific coast. The rolling stock on 30 June 1905 comprised 1,307 locomotives, 582 first-class passenger cars, 36 parlor cars, 46 chair cars, 18 buffet and café cars, 14 dining cars, 48 second-class passenger cars, 130 combination cars, 198 baggage and express cars, 62 mail cars, 6 officers' and directors' cars, 667 caboose cars, 51 milk cars, 27,960 box freight cars, 1,338 refrigerator cars, 254 ballast cars, 8,894 gondola cars, 4,538 platform cars, 4,075

live-stock cars, 4,505 ore cars, 34 boarding cars for men, 59 pile driving, excavator, etc., cars, and 4 rotary snow plows; total, 53,519 cars. The gross earnings of the fiscal year ending 30 June, 1905, from passengers, freight, express, and miscellaneous, were \$55,745,275.17; operating expenses and taxes, \$38,649,311.65; other charges \$7,231,576.36. This left a balance, with other income (\$553,435.00), of \$10,417,822.16. Of this \$5,174,924.00 was paid in dividends and \$4,600,000.00 in expenditures for construction, improvements, and additions to property, giving a balance income for the year of \$642,898.16; this added to the previous balance, made the balance to credit of income account, 30 June 1905, \$11,640,181.01. The operating expenses and taxes amounted to \$5,217.15 per mile of road, leaving the net earnings per mile of road for the year \$2,307.73. As compared with the preceding year, the passenger earnings increased \$312,005.48, freight earnings, \$2,038,291.59, express, mail, and miscellaneous, \$60,344.24; total of increased earnings, \$2,410,641.31; proportionately the operating expenses and taxes increased by \$1,422,202.36, leaving an increase of net earnings, \$988,438.95. Twenty-one million, five hundred and sixteen thousand, three hundred and three passengers were carried during the year at an average rate per passenger per mile of 2.02 cents. Of the company's authorized capital stock of \$100,000,000, \$73,073,430.53 had been issued to 30 June 1905. At that date the outstanding funded debt of the company, which had been decreased during the year by \$141,800, was \$1,135,000.00.

Chicago, Rock Island & Pacific Railway Company. The Chicago, Rock Island & Pacific System of railroads is composed of The Chicago, Rock Island & Pacific Railway Company, The Chicago, Rock Island & Gulf Railway Company, Chicago, Rock Island & El Paso Railway Company, with a total operated mileage of 7,761 miles.

The parent company, The Chicago, Rock Island & Pacific Railway, was incorporated by act of the Illinois legislature, approved 27 Feb. 1847, under the name of the Rock Island & LaSalle Railroad Company, the intention being, as defined in the charter, to construct a line of railroad "from the termination of the Illinois and Michigan Canal" at LaSalle, Illinois, to Rock Island, on the Mississippi River, and the capital stock was fixed at \$300,000.

The charter amended by the legislature changing the name of the corporation to the Chicago & Rock Island Railroad Company, authorizing it to continue its projected railroad by way of Ottawa and Joliet to Chicago and to increase its capital stock to \$3,000,000, was approved on 7 Feb. 1851.

Construction was begun in April 1852, and the first passenger train was run from Chicago to Joliet, a distance of 40 miles, in October of the same year. The full line authorized by the charter, from Chicago to Rock Island, was completed and placed in operation in 1854.

The Peoria & Bureau Valley Railroad, extending 47 miles from Bureau Junction, a point 114 miles west of Chicago to Peoria, was completed in the same year and was immediately leased in perpetuity to the Chicago & Rock Island Railroad Company.

CHICAGO, ROCK ISLAND AND PACIFIC RAILWAY COMPANY

On 22 Feb. 1852, Articles of Association were executed under the laws of the State of Iowa, creating the Mississippi & Missouri Railroad Company with power to construct and operate a railroad from Davenport to Council Bluffs.

Work was begun on this road in August 1853. It progressed but slowly and by 1866 there had been completed but 131 miles of its main line towards Council Bluffs, a branch having been, meantime, constructed from Wilton Junction to Washington, Iowa, a distance of 50 miles.

On 20 Aug. 1866, the Chicago & Rock Island and the Mississippi & Missouri companies were consolidated under the corporate name of the Chicago, Rock Island & Pacific Railroad Company, the entire mileage of the consolidated roads being 406 miles.

In 1867 the main line reached Des Moines and on 11 May 1869 was completed to Council Bluffs, Iowa, and a direct, unbroken line of railroad established from Chicago to the Missouri River.

During the period from 1869 to 1871 the Chicago & Southwestern Railway was built from Washington, Iowa, to Leavenworth, Kansas, 271 miles, and as each section was completed it was operated by the Chicago, Rock Island & Pacific Railroad under a traffic agreement.

This road was bonded for \$5,000,000, the payment of both the principal and interest of the bonds having been guaranteed by the Chicago, Rock Island & Pacific Company. The interest on the bonds was regularly paid, under its guarantee, by the latter company, the Chicago & Southwestern Company having, at no time, met its obligations in this respect, and in 1874 proceedings were begun to foreclose the mortgage, resulting in the sale of the road and property in the year 1876 to the Iowa Southern & Missouri Northern Railroad Company.

During the period from 1872 to 1878 several branch lines, under various corporate names, were constructed in Iowa, and in Missouri the Atchison Branch was built from Edgerton Junction to Rushville on the east bank of the Missouri River, opposite Atchison, and several of the previously existing branches were further extended.

In May 1878, the Keokuk & Des Moines Railway, extending from Keokuk, Iowa, to Des Moines, 162 miles, was leased for the remainder of its corporate existence, and in December 1879 an agreement was made with the Hannibal & Saint Joseph Railroad whereby trackage rights were secured for trains of the Chicago, Rock Island & Pacific Railroad over that road between Cameron and Kansas City, 54 miles.

On 2 June 1880, all the branch lines heretofore referred to, together with the Iowa Southern and Missouri Northern Railroad, were consolidated with the parent company, forming The Chicago, Rock Island & Pacific Railway Company. The consolidated company thereby became the owner of the various lines before described, also the lessee of the Peoria & Bureau Valley Railroad and the Keokuk & Des Moines Railway and succeeded to the trackage rights over the Hannibal & St. Joseph Railroad between Cameron and Kansas City, a total mileage of 1,311 miles.

The Saint Joseph & Iowa Railroad was com-

pleted from Altamont, via Saint Joseph, to Rushville, Missouri, in 1885 and in 1888 was sold to The Chicago, Rock Island & Pacific Company.

On 17 March 1886, the Chicago, Kansas & Nebraska Railway Company was incorporated under the laws of the State of Kansas, and on the 31st day of the same month the Chicago, Kansas & Nebraska Railroad Company was incorporated under the laws of Nebraska, both being soon thereafter leased to the Saint Joseph & Iowa Company with all railroads then owned or that might be thereafter owned or acquired by them.

On 20 Dec. 1886, the Nebraska corporation conveyed all its property to the Chicago, Kansas & Nebraska Railway Company, the Kansas corporation.

The Chicago, Rock Island & Colorado Railway Company had been incorporated in January 1886, with power to construct a railroad from the Kansas-Colorado State line towards Colorado Springs.

On 13 June 1888, the Chicago, Kansas & Nebraska and Chicago, Rock Island & Colorado companies were consolidated under the corporate name of the former company.

Meantime, the construction of its various lines by the Chicago, Kansas & Nebraska Company was being continued with great energy and in but little over two years their completed lines of railroad aggregated 1,484 miles.

Pursuant to an order of the court, 20 April 1891, the roads and property of the Chicago, Kansas & Nebraska Railway Company were purchased by The Chicago, Rock Island & Pacific Railway Company; the bonds issued by the first named corporation having been held by The Chicago, Rock Island & Pacific Company, and the former company being in default for interest due thereon.

In 1892, the Lincoln line, from South Omaha to Lincoln, constructed in 1890, was extended to Jansen, Nebraska, and the southern line, theretofore ending at Minco, was completed to Terral, Indian Territory, a point on the Red River at the Texas State border, there connecting with the Chicago, Rock Island & Texas Railway, which road was then under construction to Fort Worth, Texas; that point being reached in July 1893.

In 1898 51 miles of road were built from Chickasha to Mountain View, and a branch of the Chicago, Rock Island & Texas Railway was constructed 28 miles from Bridgeport to Graham, Texas. In 1899, 43 miles of road were built in Oklahoma. In 1900, the Mountain View line was further extended to Mangum, 47 miles, and 109 miles were built in Iowa from Gowrie to Sibley, under the charter of the Gowrie & Northwestern Railway Company.

During the year 1901, 36 additional miles were built in Oklahoma, from Anadarko to Lawton, and in the same year work was begun under the charters of the Chicago, Rock Island & Mexico Railway in Texas and the Chicago, Rock Island & El Paso Railway in New Mexico; these roads to form, with the Liberal line, also extended during this year 56 miles to the Oklahoma-Texas border, a direct line to Santa Rosa, New Mexico, there to connect with the El Paso and Rock Island Railway, already under construction.

CHICAGO SUBWAY

During 1901 under the charter of the Enid & Anadarko Railway Company, The Chicago, Rock Island & Pacific Company built a line of road from Enid to Watonga, a distance of 60 miles, that was, in the following year, extended 45 miles, to a connection with the Mangum line at Anadarko. The Enid & Anadarko Company also built the Lawton-Waurika line — 41 miles in length.

In April 1902, by purchase of all the capital stock and all of the bonds of the St. Louis, Kansas City & Colorado Railroad Company, The Chicago, Rock Island & Pacific Railway Company became owner of a line of railroad under construction from Saint Louis to Kansas City which has since been completed and placed in full operation.

In May 1902, by purchase of the entire issue of both the common and preferred stock of the Choctaw, Oklahoma & Gulf Railroad Company, The Chicago, Rock Island & Pacific Railway Company acquired ownership of the road and property of that corporation, thus adding to the system 1,052 miles of road with its proprietary control of 112 miles of railway built under the charter of the Choctaw, Oklahoma & Texas Railroad, together with extensive coal fields and coal mines.

On 1 June 1902, all the lines of the Burlington, Cedar Rapids & Northern Railway, 1,311 miles, and the Rock Island & Peoria Railway, 118 miles, were leased to The Chicago, Rock Island & Pacific Railway for 999 years, both roads being purchased by the latter railway in June 1903.

In 1902, also, the Jacksboro branch of The Chicago, Rock Island & Texas Company was further extended to Graham, Texas, and under the corporate name of The Chicago, Rock Island & Gulf Railway Company, a line of road was built from Fort Worth to Dallas, Texas.

In the latter part of the year 1903 the Texas companies, theretofore separately known as Chicago, Rock Island & Texas Railway, Chicago, Rock Island & Mexico Railway, Choctaw, Oklahoma & Texas Railroad, were, under authority granted by the State of Texas, sold to, and consolidated with, The Chicago, Rock Island & Gulf Railway Company.

In the years 1905 and 1906 under the charter of the Little Rock & Southern Railroad Company, a line of railroad was built from a point near Hot Springs to Eldorado, Arkansas, 112 miles, where connection was made with the Arkansas Southern Railroad, a property previously acquired, the latter extending 109 miles to Winnfield, Louisiana. These two properties, together with a branch of the Little Rock and Southern Railroad, 36 miles in length, were, in 1906, consolidated under the corporate name of the Rock Island, Arkansas & Louisiana Railroad Company and soon thereafter the consolidated company was leased to The Chicago, Rock Island & Pacific Company for 999 years.

Thus, in the early part of the year 1906, although the original charter contemplated but 82 miles of railroad, the operated mileage of The Chicago, Rock Island & Pacific Railway System had increased to a total of 7,761 miles of railway, with approximately 300 miles of second track and 1,750 miles of sidings.

For the year ending 30 June 1905 the total

earnings were \$44,051,509 and other income was \$1,526,171. The operating expenses were \$31,058,209, leaving the total net income \$14,519,476.

B. L. WINCHELL, *President*.

Chicago Subway, The. The problem of relieving the congested area of a large city is one that has been studied by prominent engineers and leading men in both this country and abroad. The result was the building of subways or tubes to take care of the passenger traffic below the surface. While this solution resulted in a partial benefit as far as furnishing a rapid transit system, it did not relieve the streets from the congestion caused by heavily loaded trucks, etc.

It remained for Chicago to solve the problem in the most logical way, namely, the building of a subway or tunnel system for the transportation of mail matter, newspapers, packages, merchandise, coal, etc., underground.

The tunnel is being built under an ordinance granted to the Illinois Telephone and Telegraph Company by the city council of the city of Chicago, passed 20 Feb. 1899, and a supplementary ordinance passed July 1903.

The actual work of constructing this tunnel system by which Chicago will lead the world was commenced in September 1901 by the Illinois Telephone Construction Company.

The business district of Chicago comprises about 1½ square miles of territory and is completely surrounded by the passenger stations and freight depots of the 25 trunk lines, which makes Chicago the greatest railroad centre in the world. It is estimated that the freight handled daily at the freight depots in Chicago amounts to more than 112,000 tons, and with the present facilities afforded by the tunnel will relieve the congestion and facilitate the transaction of business in the business section, removing about 80 per cent of the heavy teaming from off the streets.

The tunnel as built is egg-shaped, with walls of concrete. The walls of which are 10 inches thick with a 14-inch bottom. They are 6 feet wide and 7 feet 6 inches high, inside measurement, and are at an average depth of 40 feet below grade.

The tunnels are built with the assistance of the pneumatic system, although a number of thousand feet were constructed without the use of air. The work is pushed day and night and the 24 hours are divided into three eight-hour shifts. The shift which goes to work at 4 p.m. being known as the driving shift; this shift is relieved at midnight by another shift that finishes the drive, taking out the bottom, and does the trimming. The day shift does the concreting. Undue precaution is observed at every stage of the work. Half-hourly reports of the progress of the work are forwarded to the chief engineer's office and any fluctuation of the air pressure or change in the nature of the soil is immediately reported to the chief engineer in person, who remains in touch with the work constantly.

The great advantage of the concrete tunnel over a brick one is that there is no chance for a settling of the streets. In using brick it is impossible to dig a tunnel so true that the brick work will fit snugly, consequently they are obliged to back fill with clay, slabs, or any other material that is handy; this leaves voids, which

CHICAGO FREIGHT SUBWAY

are bound to cause settlement. In the use of concrete it is necessary to tamp the concrete tight to get a perfect bond, and in so doing it fills up every void, no matter how uneven, making it an impossibility for any chance of a settlement. It is with just pride that the management can say that from the time the work started up to the present date the company has not received one complaint of any damage having been done to the streets of Chicago or adjoining property.

There has been more than 175,000 lineal feet of tunnel built up to the present time. The system now reaches every passenger depot and freight house, and connections are being made with these as well as the warehouses, wholesale houses, retail houses, manufactories, etc., as fast as the alterations necessary in the building can be made. The first railroad to make provisions to use the subway was the Lake Shore and Michigan Southern in their new freight house at Clark and Taylor streets.

What, no doubt, will be of great interest to the engineers, practical men, and contractors is the fact that during the months of April and May there were five miles of tunnel constructed under the streets of Chicago. During the month of April there were constructed 10,105 lineal feet, and during the month of May there were constructed 12,619 lineal feet of tunnel, with the necessary appurtenances to make it practical to operate electrically-propelled trains, such as rails, trolley system, permanent lighting, drainage system, etc.

The construction of this number of feet, with the necessary intersections, by-passes, etc., in the time mentioned above is something entirely out of the ordinary. When it is taken into consideration that the general average in tunnel construction up to the present time has been at the rate of two miles per year, even under the best conditions and where the soil has been uniform. In carrying out the work it has been necessary during the past two months to excavate about 60,000 cubic yards of material, and manufacture and place into position about 35,000 cubic yards of concrete. All the excavated material was transported through the completed tunnel system and deposited at Grant Park, at which point it is being used for filling for the improvement of the park. In connection with the same there was transported through the tunnel about 1,500 cubic yards of excavated material daily from the following buildings: Heyworth, Majestic, Mandel Brothers, Marshall Field, and new Edison, and in fact all the new buildings being erected in the down-town district are having their excavated material hauled by the tunnel company.

The transporting of excavated material and wreckage through the tunnel system has been more than beneficial to the people and the users of the streets of Chicago; owing to the fact that it has been the means of keeping a large number of teams off the streets, which have previously been engaged in hauling refuse and excavatings from the new buildings. The benefits to the community are many, as it has already been the means of removing a part of the congestion, as well as keeping the streets free from dirt and refuse, which has always fallen off of wagons engaged in this class of teaming.

In New York, Boston, and Philadelphia many structures have been built which extend

30, 40, or 50 feet below the street surface, and such basements are now being built in Chicago, and will be available in a way more advantageous than in the above-named cities; since the floor of the sub-basements will be carried to the level of the subway.

The conditions caused on account of the many styles of buildings which are to be tapped, and the many purposes for which the tunnel is designed, is a constant tax on an engineer's ingenuity, as no two buildings are alike and each requires its own treatment. Where the tunnel connects with a building whose basement extends but one story below the street grade, a turnout or by-pass is constructed leading from the main tunnel to the inside of the curb line, where it connects with a shaft leading to the basement under the sidewalk. Specially designed elevators lift the cars to the basement floor. Where with the use of a turntable they can be shoved wherever they are desired. The elevators so far in use are tested to carry 30,000 pounds.

The gauge of the permanent track is 24 inches, and the Illinois Steel Company 4¼-inch 56-pound rail was adopted as the standard rail. The rail is fastened by U bolts to a specially designed cast iron chair embedded in the concrete floor of the tunnel. The great number of crossings and switches in use necessitated by all the street intersections, turnouts, or by-passes leading to the different buildings made it imperative that this part of the track system be as near perfect as could be made. The crossings in use are all bolted to steel plates that extend over the entire crossing, and this is embedded in the concrete floor. The switches are those known as the split switches and the frogs are constructed the same as the right-angle crossings.

The overhead trolley is used throughout except at the incline at the Lake Front, where the Morgan third-rail system is used. The third-rail consists of a steel strip about one half inch in thickness by four inches wide, clamped between insulated wood stringers laid lengthwise in the centre of the track. The rail furnishes not only the current for the locomotive, but the means of moving the locomotive also; for it is provided with an opening for cog wheels which are pressed onto the axles. A 0000 figure 8 trolley wire is adopted as the standard, held in place by Porter & Berg's standard barn trolley hangers placed 15 feet on centre.

Automatic section insulators and throw will be in use at all street intersections, which enables the current to be cut out in any block during temporary repairs without shutting off the current from any other part of the system.

Much consideration has been given to the style of cars and electric locomotives to be used for the work. On the incline at the Lake Front it was found advisable to use the Morgan B type of locomotive, while in the tunnel proper there are two types in use, namely, the Jeffreys standard M. H. locomotive, and the General Electric standard L. M. locomotive. The weight of the Jeffrey locomotive is six tons and is equipped with two 18 horse-power motors, while the weight of the General Electric locomotive is five tons, and it is equipped with two 20 horse-power motors. The locomotives are of a low and compact construction.

CHICAGO SUMMER SCHOOL — CHICKAHOMINY

The styles of cars in use are the Kilbourne & Jacobs and the Bettendorf double-truck type. The cars are 12 feet 6 inches in length over all and 47 inches in width. They are of steel and iron construction throughout, and can be used either as a gondola or a flat car, and every car is equipped with the M. C. B. coupler. The weight capacity of the car is 30,000 pounds. The double trucks are so built that the cars readily operate upon a curve of 15-foot radius. At the present time the box cars are equipped with the Newman patent dump box, which has a capacity of 3½ yards. The number of locomotives and cars now in use is large and is rapidly being increased.

The tunnel is well lighted throughout by electricity. The current for light and power is supplied at present by the Chicago Edison Company. Power for the trains will be furnished by a 5,000 horse-power generating plant. Direct current at 250 volts, the rails furnishing the return, is the system in use.

The tunnel company has leased from the Northwestern University a tract of land on the Chicago River at 24th Street where it will erect its own power house. The company will also erect large warehouses where it will be possible for merchants, who only have a limited amount of space, to store a large supply of goods, drawing upon the same as needed. These warehouses will be erected on the company's own property on the west bank of the river at Taylor Street.

There is an automatic phone at each street intersection of the tunnel and all trains are operated by phone. The cables for the telephone system are hung from the roof of the tunnel with a specially designed adjustable strap. Guards are stationed at street intersections and every precaution is taken to avoid accidents. The many connections already made with the tunnel insures thorough ventilation. The floor of the tunnel is dry and as smooth as the average cement pavement.

The tunnel system now extends from Indiana Avenue on the north to 15th Street, on the south and west as far as Halsted Street, and is rapidly being extended beyond these limits.

An employee of the company was once asked by a friend where he worked, and his reply was, "In New Chicago." The friend said, "Well, I have heard of South Chicago, North Chicago, East Chicago, West Chicago, and Chicago, but New Chicago never." This man's description of the tunnel system of New Chicago is an apt one; as the system furnishes to a certain extent a duplicate set of streets for Chicago. These streets are lighted by several thousand electric lamps, and at the street intersections have bronze street signs.

The construction of this work requires a large force of men, including artisans and men of all trades. The pay-rolls of the company carry close on to 2,000 names; while it is safe to say that at least 200 more are employed by the company hauling supplies and material for the work. And yet notwithstanding all the different trades represented and the army of men employed, there has never been any labor troubles or dissatisfaction among the men.

The entire designing and construction of the 175,000 feet of tunnel has been under the direct

management of George W. Jackson, consulting engineer, who is also general manager and chief engineer for the Illinois Telephone Construction Company.

GEORGE W. JACKSON.

Chicago Summer School. See SUMMER SCHOOLS.

Chicago University. See UNIVERSITY OF CHICAGO.

Chichen, chī-chān', or **Chichen-Itza**, ē-tzä', Mexico, an ancient ruined city of Yucatan, 18 miles southwest of Valladolid. Its magnificent ruins have a greater appearance of antiquity and are in better preservation than most of the other ruined cities of the same province, which has received much attention from archæologists on account of its remains of a little known people in a state of considerable civilization. Here have been studied the most interesting and important remains of the Mayan tribe of Itza. Among the ruins of the ancient city is a pyramid 550 feet square at the base; a vast building, supposed to be a temple, with bas-reliefs; houses containing sculptured chambers; and many other structures of archæological interest.

Chichester, chich'ēs-tēr, England, a municipal borough and episcopal city, near the southwest corner of the county of Sussex. It is well built and has wide streets. Its old wall, still in good preservation and lined with lofty elms, gives it a very picturesque appearance. Its principal edifice is the cathedral, an ancient Gothic structure, with one of the most graceful spires in England, and containing among many monuments one of the poet Collins, who was born and died here. The fine old octagonal market-cross should also be mentioned. Pop. (1901) 12,241.

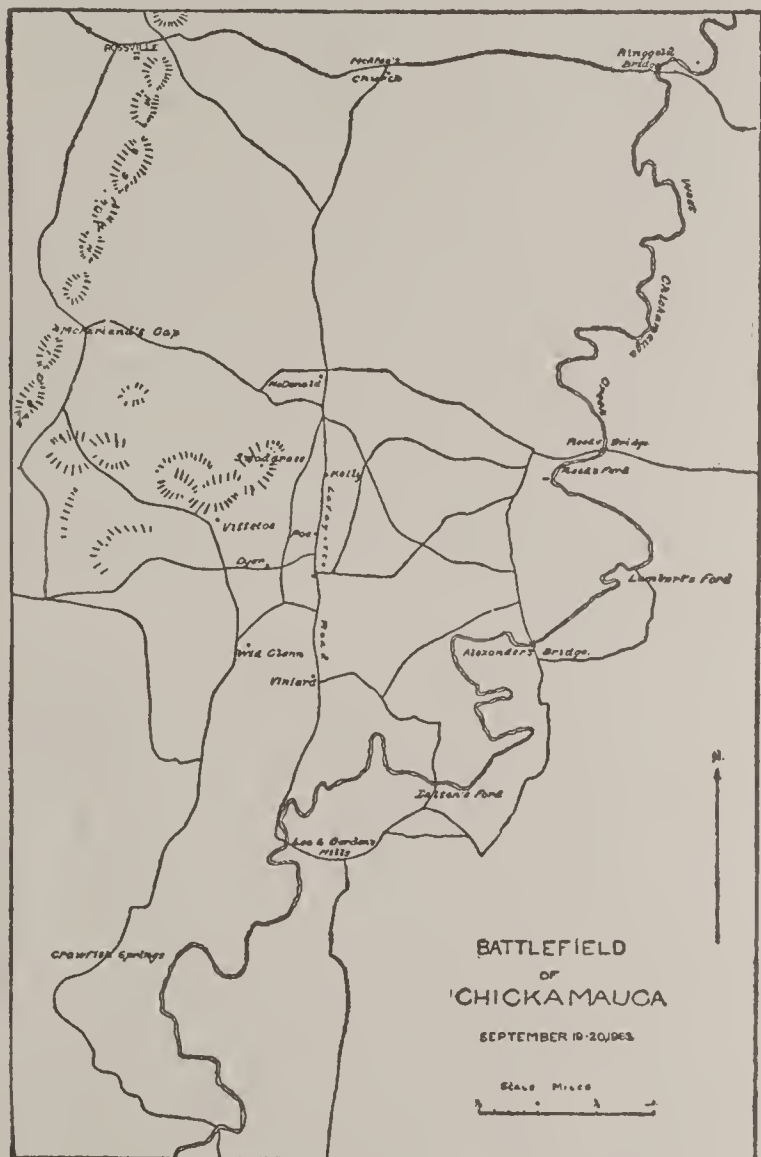
Chick-pea, the popular name of *Cicer arietinum* and other plants of the same genus, growing wild along the shores of the Mediterranean and in many parts of the East, and producing a short puffy pod with one or generally two small wrinkled seeds. It is an important article of French and Spanish cookery, and the plant is cultivated in Europe, Egypt, Syria, India, Mexico, etc. When roasted it is the common parched pulse of the East. It is sometimes used as a substitute for, or as an adulterant of coffee. The herbage serves as fodder for cattle. The chick-peas are leguminous plants of the vetch tribe, differing from the vetches mainly in the fruit. Seven species are known, having the flowers solitary or in small axillary groups.

Chick'-a-dee (an onomatopoeic word, imitating the note of the bird), a local name for the black-cap titmouse. See TITMOUSE.

Chickahom'iny, a river in Virginia, about 75 miles in length. It is an affluent of the James and runs parallel to it for many miles from its source northwest of Richmond. As its course was between the Union armies and Richmond, on and near it occurred many of the most important events of McClellan's Peninsula campaign in 1862, including the battles of Williamsburg, Hanover Court-House, Fair Oaks, Mechanicsville, Cold Harbor, Savage's Station, Frazier's Farm, and Malvern Hill (qq.v.). The second battle of Cold Harbor under Grant occurred 3 June 1864.

CHICKAMAUGA

Chickamauga, *chik-a-mâ'ga*, **Battle of**, fought near Chickamauga Creek, and on Georgia soil, 19-20 Sept. 1863. Gen. Rosecrans (q.v.) having forced Bragg (q.v.) out of his fortified position in Middle Tennessee by a campaign of strategy, prepared to gain possession of Chattanooga, the gateway through the mountains to the Gulf States, and a most important railroad centre for the Confederacy. Bragg held the city, which was beyond the Cumberland Mountains and the Tennessee River. Rosecrans' army lay along the western base of the Cumberlands. His headquarters were at Winchester, Tenn. His army was composed of three corps of infantry, the Fourteenth, Gen. George H. Thomas; the Twentieth, Gen. Alex. McD. McCook; and the Twenty-first, Gen. Thomas L. Crittenden. Gen. D. S. Stanley commanded the one corps of cavalry. McCook's corps was the right wing, Thomas'



the centre, and Crittenden's the left. Stanley's cavalry guarded the right flank, and Minty's brigade of cavalry the left.

The plan of campaign involved the repair of the railroad to the Tennessee River, the collection of supplies for a month's absence from any base, and ammunition for two battles. It also included throwing Rosecrans' army to the rear of Chattanooga and advancing to it from the south. His centre and right were ascending Lookout before Bragg became aware of the character of the movement. He then evacuated Chattanooga and moved to La Fayette, 26 miles south and behind Pigeon Mountain, the next range east of Lookout, leaving his rear-guard just below Lee and Gordon's Mill at the crossing of the Chickamauga. Crittenden having accomplished his purpose north of the Tennessee, withdrew through Sequatchee Val-

ley to the river, crossed both that and the Sand Mountains, and entered Lookout Valley near the north point of Lookout Mountain. A reconnoitering party, 9 September, discovered the evacuation of the city. Passing around the point of the mountain, Crittenden, leaving one brigade in the city, proceeded at once by way of Rossville Gap to operate to the left of Thomas, who had descended Lookout at Stevens' Gap. McCook was further to the right, having crossed Lookout at Winston's. The grand strategy of the campaign had been entirely successful. The army had been thrown over three formidable mountain ranges and a wide river, all within the immediate territory of Gen. Bragg, without opposition, almost without discovery, and entirely without loss. To possess Chattanooga it remained necessary to concentrate the widely separated corps in it, or between it and Bragg.

Erroneous dispatches led Rosecrans to believe that Bragg was retreating on Rome. He ordered pursuit, and found Bragg occupying the gaps in Pigeon Mountain in force and preparing movements against each separate corps. These failed, and Bragg, having notice of the arrival of Longstreet, with two divisions from the Army of Northern Virginia, issued, 18 September, orders of battle designed for interposing between the Union army and the city. At this time the main bodies of the two armies confronted each other across the upper Chickamauga, and Longstreet was arriving at Ringgold. Crittenden's corps was concentrated at Lee and Gordon's mill.

During the afternoon of the 18th Gen. Bushrod Johnson from Ringgold, in command of five brigades, including Hood's division of Longstreet's corps, forced a crossing at Reed's Bridge, after a sharp defense by Minty's cavalry. Walker's corps, after failing at Alexander's Bridge, which was defended by Wilder's brigade of mounted infantry, crossed at a ford below. During the night about two thirds of Bragg's army crossed the Chickamauga, and early in the morning of the 19th he formed line of battle directly on Crittenden's left flank and in near contact with it. Bragg's plan was to drive Crittenden's corps back on Thomas in the centre, and both on McCook at the right, and force the whole into the mountains. His plan of battle was interfered with and finally destroyed by an undiscovered night advance of Rosecrans' centre and right, by which he passed several miles beyond Bragg's position and thrust his lines across the La Fayette road and eastward to the Chickamauga, and so gained position between Bragg and Chattanooga. The head of Thomas' corps, which struck Forrest's cavalry at Jay's Mill, was Brannan's division. The fighting became desperate, and at close quarters, and so continued until 1 o'clock, when Forrest and his supports were repulsed. Soon both armies were rapidly advancing toward this vortex of fierce fighting. It was of desperate character on both sides, continuing from noon until sunset, with alternate success and repulse for each side, the field finally remaining in possession of the Union forces. The deadly fighting throughout the day had been largely in forests thick with underbrush, and so all within the limits of point-blank range. At nightfall Cleburne's division burst with great force upon the lines of

CHICKAMAUGA

Johnson's and Baird's divisions, which were well in advance at the centre. They gradually withdrew from under the fire which continued for an hour after dark. At the close of the fighting for the day Rosecrans' army held the La Fayette road between Bragg and Chattanooga, and Bragg's plan of battle for the day had been effectually defeated.

On the Union side the entire force except five brigades had been engaged. Of Bragg's army three divisions and one brigade present had not been engaged, and two brigades did not arrive until the second day. At the close of the first day's battle the Confederate line extended from Hall's Ford to Jay's Mill. The Union line was brought back nearer to the La Fayette road, which was the axis and the objective of the battle. The Confederate line extended far beyond the Union left. Counting by brigades, the Union line was overlapped on its left by four brigades of cavalry, two fighting dismounted, and two brigades of infantry, and on its right by two brigades of infantry. The Confederates had 15 brigades in their reserves, counting Longstreet's second and third lines, Law's and Kershaw's divisions, at the centre. The Union army had five, an overlapping force for the Confederates of four brigades, and an excess of 10 in the reserves. The Union line had strengthened its front by logs, stumps, stones, and fence rails. Counting by divisions from left to right, it was formed as follows: Baird, Johnson, Palmer, and Reynolds east of the La Fayette road; Brannan, Negley, Davis, Sheridan, and Wilder's Mounted Brigade west of it, with Wood and Van Cleve in reserve. The Confederate line, from right to left, was thus composed: Pegram and Armstrong of Forrest's cavalry, Breckenridge, Cleburne, Stewart, Bushrod Johnson, Hindman, Preston, with Walker, Liddell, Cheatham, Law, and Kershaw in reserve.

The Confederates attacked about 9 o'clock, Breckenridge moving against Baird, the left brigade, striking Baird's rude works, being broken on them and its commander being mortally wounded. The other two brigades swung around full in the Union rear, but were driven back after sharp fighting. Cleburne and Stewart assaulted in succession and were both repulsed. At 11 o'clock Negley, in rear of the Brotherton house, had been replaced by Wood from the reserve, and sent to the left. Brannan, on the left of Wood, had also been ordered to the left, but the Confederate attack developing on his front, he did not move. Upon the supposition that he had gone, Wood was ordered to close on Reynolds, the next division to the left of Brannan. Wood moved promptly to find Reynolds. This left a gap, just as Longstreet, with a column of three divisions, Bushrod Johnson in the front line, Law in the second, and Kershaw in the third, was moving to attack Wood's position. This broke the Union centre. Davis' and Sheridan's divisions to the right of the break were rushed toward the gap, but failed to restore the line, and being attacked in front and on both flanks by Johnson's and Hindman's troops were forced off the field in confusion. Rosecrans, Crittenden, and McCook, being with the right wing, were driven off the field with that portion of the army which left it. Brannan's division, the first on the left of the break, swung back nearly at right angles,

and took position on Snodgrass Hill, a quarter of a mile in the rear, on which also rallied other portions of the Union army that had been scattered or broken. At noon Forrest's cavalry, opposite Cloud's, had crossed the La Fayette road and captured the field hospitals of the Union left wing.

The four divisions of Baird, Johnson, Palmer, and Reynolds maintained their lines around the Kelly field. At 1 o'clock Gen. Thomas had formed parts of Brannan's, Wood's, and Negley's divisions, with various fragments, on Snodgrass Hill. Negley had left at noon with two regiments of infantry and 40 guns. Gen. Thomas then found himself with only one battery. About 1:30 the hill was assaulted by five brigades, that of Fulton overlapping Brannan's right and gaining the valley in his rear. At this juncture Gordon Granger arrived from McAfee's Church with Whitaker and Mitchell's brigades of Steedman's division, and promptly attacking, drove the Confederate force which had crossed the ridge over it again, and extended Gen. Thomas' line for a half mile along the crest. About the same time Van Derveer's strong brigade arrived from its successful charge on Breckenridge in the Kelly field and strengthened Brannan's line. Longstreet's assault continued with little intermission until sundown, all being of the most courageous character. Finally 11 Confederate brigades were participating in the attack on Snodgrass. For its defense Thomas at the last had five brigades and about one half of two others. There was little fighting on the Kelly field line after 1 o'clock, though Bragg ordered a general attack for 3. It was not delivered until about sundown. At 3 Longstreet, from Snodgrass Hill, asked Bragg for re-enforcements, but was informed that the right wing had been so beaten back that it could be of no service to him. Longstreet's last assault was with troops that had not been engaged. Their attack began at 4:30 and lasted until 6. They gained a salient of the Union line and held it for an hour, with a loss of 36 per cent, but were finally dislodged by Gen. Charles H. Grosvenor's regiment.

At 5:30 Gen. Thomas began withdrawing his army. The four divisions on the Kelly field retired in succession from right to left. Reynolds and Palmer were not attacked. The Confederate attack ordered for 3 o'clock was delivered just as Johnson and Baird were leaving their lines, and some captures were made, though both reached the forest west of the La Fayette road without disorganization, and followed the rest of the left wing through McFarland's Gap to Rossville. At 7 o'clock the Snodgrass Hill line began to retire from left to right. Steedman's withdrew at 6, sundown. Fighting in his front had ceased. An hour later Trigg and Kelly, passing over the ground which Steedman had occupied, captured the greater part of three Union regiments which were temporarily attached to the left of his line, and by mistake had not received notice of the withdrawal. The last volley of the battle was fired by troops of Van Derveer's brigade at Kelly's and Trigg's lines, which, after capturing the isolated troops, attempted to move on Van Derveer's position. Davis' division, which had been cut off at noon, reached a point on its return near Gen. Thomas' right at sundown.

CHICKAMAUGA NATIONAL MILITARY PARK — CHICKASAW BAYOU

Gen. Sheridan, who had continued to Rossville, marched toward the field from that point, reaching Cloud's an hour after sundown. Both of these divisions acted as supports for the flanks, while the troops were being withdrawn. Gen. Thomas withdrew the army without molestation through McFarland's Gap to Rossville, and during the night placed it in strong position in the gap at Rossville, along the adjacent crests of Missionary Ridge, and across the valley to Lookout Mountain. It was thus firmly established between Bragg and Chattanooga. Holding his lines through the next day, at night he withdrew toward Chattanooga.

Gen. Rosecrans crossed the Tennessee with an effective force of a little above 60,000. Two brigades and an additional regiment were detached. A maximum figure for his force at the opening of the battle would be 55,000. It is difficult to approximate Bragg's force. A week after the battle he reported 38,846 effectives, and his losses to have been 18,000, which would make his force in action 56,846. Gen. R. E. Lee, writing to President Davis of Bragg's strength, five days before the battle, said: "His total effective force will therefore be 76,219, as large a number as I suppose he can operate with." This did not count Longstreet's re-enforcement, according to Gen. Lee's figures, but a large part of Longstreet's forces never reached Bragg. In view of Gen. Lee's statements, and the known overlapping of the Union lines, and the preponderance of his reserves, it would seem that Bragg's force can be fairly fixed at 70,000.

Few, if any, of the great battles of the war show an equal percentage of casualties, considering the numbers engaged and the time of fighting. The losses for killed and wounded and missing for Rosecrans were 16,179, and for Bragg 18,000. For the troops actually engaged these figures give a percentage of 33 per cent for each side. On the Confederate side, Longstreet's wing lost 44 per cent, nearly all on the second day. Bushrod Johnson's division lost 44 per cent, and Preston's 33 per cent in the attack of an hour and a half on Snodgrass Hill; and Gracie's brigade of the latter division lost 36 per cent during the same time. The brigade losses in Cheatham's division ranged from 35 to 50 per cent. The loss in Breckinridge's division was 33 per cent, and in Cleburne's 43 per cent. Bates' brigade of Stewart's division lost 52 per cent. The Confederates assaulted throughout the second day.

On the Union side Steedman's division lost 49 per cent in four hours, and all of these were killed or wounded but one. Brannan's division lost slightly over 36 per cent; Van Derveer's brigade of that division only two less than 50 per cent; Davis' division a little over 50 per cent; Van Cleve's division 23.5 per cent. Among the Union brigades Buell's loss was 45 per cent, Carlin's 53 per cent, Hazen's 34 per cent, Dick's 25 per cent, Connell's 37 per cent, and Croxton's 39 per cent.

On 22 September Bragg began to establish his lines before Chattanooga and prepare for either driving or starving the Union army out of it. Consult 'War of the Rebellion Records,' Vol. 23, parts 1 and 2; Vol. 30, parts 1, 2, 3, and 4.

H. V. BOYNTON.

Chickamauga National Military Park. Congress, in 1890, passed an act authorizing the establishment of a park on the site of the battle of Chickamauga. In carrying out the project the States of Georgia and Tennessee co-operated with the commission appointed by Congress. To the United States Federal government the citizens of each State sold and the States ceded jurisdiction over lands and roads included in or leading to the battle-field of Chickamauga, as well as the sites of those actions which took place about Chattanooga, and which the park also commemorates. The actual area of the park is 11 square miles, but to all intents and purposes it embraces a much larger tract. It was dedicated with elaborate ceremonies 19-21 Sept. 1895, and already it has been greatly beautified, and markers, monuments, etc., furnishing explanations of the field, have been erected. See BOYNTON, HENRY V.

Chick'aree, the American red squirrel; a popular name, imitative of its cry. See SQUIRREL.

Chickasaw Bayou, or Bluffs, Battle of. On 8 Dec. 1862 Gen. Grant ordered Gen. W. T. Sherman to organize at Memphis, Tenn., an expedition which, in co-operation with Admiral D. D. Porter's gunboat fleet, should reduce Vicksburg. On the 22d the expedition rendezvoused at Friar's Point on the Mississippi, ready to move up the Yazoo River in rear of Vicksburg. Sherman had the four divisions of Gens. F. Steele, Geo. W. Morgan, M. L. Smith, and A. J. Smith, aggregating about 30,000 men. The transports, preceded by the gunboats, entered Yazoo River on the 25th, and on the 26th and 27th the troops were landed on its south bank, confronting the bluffs overlooking the swamps through which ran Chickasaw Bayou. Gen. J. C. Pemberton, commanding the Confederate forces in Mississippi, was at Grenada opposing Grant, who was moving south from Grand Junction and Corinth on the line of the railroads. On the 21st Pemberton heard that the fleet and transports were moving down the Mississippi for the supposed purpose of attacking Vicksburg, which at the time was held by Gen. Martin L. Smith with the brigade of Gen. S. D. Lee. Vaughn's brigade was immediately ordered to Vicksburg, and was soon followed by the brigades of Gregg and Barton. Pemberton arrived at Vicksburg on the 26th and the last of the three brigades during the night of the 27th. Pemberton disposed his forces, Vaughn, Gregg, Barton, and Lee, on a line from Vicksburg on the left to Haynes' Bluff on the right, a distance of 13 miles, on high ground overlooking Chickasaw Bayou and the Yazoo River, S. D. Lee holding Walnut Hills from Vicksburg to Snyder's Mill on the right, a distance of 10 miles. Lee was a good engineer and a fine officer; he strengthened his position by works for his batteries and rifle-pits on the slope of the bluff, which rose to an elevation of about 200 feet above the bayou. Between this position and where Sherman had landed was bottom land, almost wholly densely wooded, intersected with bayous and low, swampy ground. There were but three roads through this area, and these were obstructed by earthworks and felled timber. By these roads Sherman advanced on the morning of the 27th, Steele on the left, Morgan on the right of Steele, and

CHICKASAW

M. L. Smith and A. J. Smith on the right of Morgan. There was heavy skirmishing on the 27th and 28th, the Confederate outposts were driven in, and at night of the 28th the Union troops lay parallel to Chickasaw or Walnut Hills bluff and about 600 yards from its foot. The main assault on the bluff was to be made by Morgan, supported by Steele; while, to make a diversion in favor of Morgan, A. J. Smith, with M. L. Smith's division and one brigade of his own, was to cross a lake, a mile below Morgan, by a narrow sand-bar, and attack. On the extreme right the rest of A. J. Smith's division was to demonstrate on the road to Vicksburg. On the morning of the 29th Morgan represented to Sherman that an attack from his position was impracticable; but Sherman, after an examination, made no change in his disposition, and rode off to his headquarters, whence he sent his adjutant-general to Morgan with this message: "Tell Morgan to give the signal for assault; that we will lose 5,000 men before we take Vicksburg, and may as well lose them here as anywhere else." Morgan replied that Sherman's entire army could not carry the position in his front, but that he would order the assault. De Courcy's brigade of Morgan's division, and the two brigades of Blair and Thayer of Steele's, were formed for the assault. The signal was given by a heavy artillery fire upon the Confederate lines, and at 12 o'clock the three brigades went forward. By some misunderstanding Thayer's brigade, with the exception of the 4th Iowa, diverged too far to the right, but De Courcy, Blair, and Thayer (with the 4th Iowa), about 6,000 men, after clearing the obstruction in front and floundering through deep mire and tangled marsh, under a terrific fire of artillery, finally made a lodgment on the hard table-land at the foot of the bluff, where an abandoned line of works gave shelter, and where some of the men stopped. All formation was broken up, brigades and regiments mixed, but on went the main body, pushed up the bluff, and reached different points of Lee's works, but were met on both flanks by such a withering fire from the rifle-pits that ran diagonally up the slope of the hill, and so severe a cross-fire of shell and canister from the batteries, that the men faltered and, no support being in sight, fell back to the point of starting, leaving about 1,500 killed, wounded, and captured. Lee lost 115. More to the right, where A. J. Smith was to demonstrate, the 6th Missouri gained the levee at the foot of the bluff, but not able to go farther under the hot fire poured upon them from above, the men sought shelter by digging with hands and bayonets into the bank of the levee, where they remained until night covered their withdrawal, after a loss of 57 killed and wounded. Sherman thought of renewing the assault in the morning, but after a personal examination he came to the conclusion that the enemy's centre could not be broken without crippling his army beyond the power to act with any vigor afterward, and proposed to attack Haynes' Bluff, higher up the Yazoo. Preparations were made to assault at 4 o'clock on the morning of 1 Jan. 1863. Admiral Porter, who was to co-operate in this attack, found the fog so dense on the river that he could not move his boats. The attack was deferred and then abandoned, and by sunrise, 2 January, the troops were all re-embarked on transports and sailed

for Milliken's Bend. The Union loss in the assault on Chickasaw Bluffs and in the skirmishing preceding it was 1,213 killed and wounded, and 563 missing. The Confederate loss was 177 killed and wounded, and 10 missing. Consult: 'Official Records,' Vol. XVII.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. III.; F. V. Greene, 'The Mississippi.'

E. A. CARMAN.

Chickasaw, *chik'a-sâ*, the most active and warlike tribe of the great Muskogean (q.v.) Indian stock; a branch of the Choctaw (q.v.), and according to their own tradition, not separated till after the united tribe crossed the Mississippi eastward. They occupied north-eastern Mississippi, and the adjacent part of western Tennessee to the Ohio. Their chief settlements were on the head-waters of the Tombigbee and Yazoo, about the present Pontotoc and Chickasaw counties, and a trail led to them from the site of Memphis, 160 miles off, their principal Mississippi landing. They were first found by De Soto, who reached the village of "Chicaça," with 200 houses, on the west bank of the Yazoo, 17 Dec. 1540, and remained there till March; but when he undertook to impress some of the Indians as porters, he was repeatedly assailed, the village fired, his path barred by a stockade, and he lost many men before he beat them off. English traders penetrated thither in the 17th century. After the French settlement at Mobile, the rivalry of the two nations first set them against the French, and for a time cut off the Mississippi trade from both; but with the French, as the only real colonists in that region, they were in constant and envenomed hostility for many years, and Bienville and D'Artaguet led expeditions against them again and again, not even a nominal peace in 1740 putting an end to their warfare. With Oglethorpe of Georgia they had friendly relations. At this time they had four large contiguous settlements, with the houses in each scattered over a space 1 to 2 miles wide and 4 to 10 long; the chief was called Chookka Pharaah, or Long House. Their sachem was called the *mico*. In 1765 Gov. Johnstone of west Florida induced them and the Choctaws to hold a council with him at Mobile, where a trade tariff was framed; but the white traders among them soon precipitated fresh troubles. After the Revolution, at the great general treaty of Hopewell, 28 Nov. 1785, their *mico* Pio and others made a treaty delimiting their lands from the Ohio River to the Mississippi State line. Their number was then estimated at 800 to 1,200. The reliability of these estimates may be judged from the fact that they are said to have had 10,000 warriors when they crossed the Mississippi, 450 in 1755, 750 in 1764, and 500 in 1768. In 1793 they joined the whites against the Creeks, and continued friendly to the settlers. In 1805, 1816, and 1818, they gradually ceded all lands north of the Mississippi line. About 1800, as the hunting grounds narrowed, the tribe began to migrate west of the Mississippi, as did the Cherokees and others. In 1822 there were in Mississippi 3,625 on a reliable count, with eight towns, and a progressive civilization: they were industrious farmers and cattle-men, marketing live stock among the whites. By the treaty of Pontotoc Creek, 20 Oct. 1822, they made another large cession of

CHICKEN — CHICKEN-SNAKE

lands; and by that of Washington, 24 May 1834, they gave up all the remainder, the two cessions comprising 6,442,400 acres, or over 10,000 square miles, for which they received \$3,646,000. On 17 Jan. 1837 they bought of the Choctaws for \$530,000 a district on the Red River west and south of the Washita (the extreme western part of the present Indian Territory), to be inalienable except with the consent of the Choctaws; relinquished their governmental organization, and became a part of that nation, with proportionate representation in its government. A considerable number, instead of remaining with the tribe, scattered through the Choctaws, buying and taking up lands at pleasure. They lagged behind the Choctaws in progress, however; a smallpox epidemic carried off several hundred; the government annuity made them lazy; and they opened no schools till 1851. Aggrieved at being represented in the Choctaw government only according to numbers, instead of equally as a tribe, they appealed to the President, and on 27 June 1855 were given separate title to their district as the Chickasaw Nation. They organized a government with a council and two-chambered legislature, and advanced rapidly. In the Civil War, as slaveholders, and having southern agents, they joined the Confederate side; lost about one fourth of their people, and were liable to the penalties of treason. By the treaty of Fort Smith, September 1865 they were conditionally restored to their rights. On 28 April 1866 all the old treaties were renewed; but they were forced to sell to the government 7,000,000 acres of land, nearly 11,000 square miles, for \$315,000, the money to go to their former slaves unless they admitted them to full tribal citizenship. They held off for some years, but finally acceded on 10 Jan. 1873. The "nation" in 1900 numbered 5,872, of whom probably two thirds were Chickasaws proper, and they are increasing.

Chicken. See FOWL.

Chicken-flea, the common name of *Sarcophylla gallinacea*, a pest of young chickens in tropical and subtropical regions, and destructive from Florida to Texas. It is smaller and shorter than the cat flea, with the eyes and antennæ in the hinder part of the head, and it does not hop. It abounds mostly in shady places, under old houses, and in earthen floors. It is first observed to infest young chickens and turkeys, and by its number and pertinacity kills young chickens, while being more or less permanently parasites on hens. Consult: Packard, 'Insect Life,' Vol. VII.

Chicken-lice, several species of bird-lice (*Mallophaga*), or louse-like wingless insects, afflicting chickens and hens. Unlike the louse (*Pediculus*), which obtains its nourishment by suction, the bird-lice have free jaws adapted for cutting feathers, though they also draw blood from the skin of their host. The large chicken louse (*Goniocotes abdominalis*) is less common than the lesser chicken-louse (*G. hologaster*); it is only one millimetre long, while the first-named kind is three millimetres long. Quite a different kind is the common hen-louse (*Menopon pallidum*), which is the most abundant and annoying of all. It differs from the others in its light color and greater activity, running among the feathers and from them upon the hands of

persons handling fowls. It is from one to one and a half millimetres long, rather slender, and of a pale straw-yellow color. Fowls should be allowed plenty of ashes and road dust in which to roll. An infested hennery should be well fumigated and whitewashed, and insect-powder should be dusted upon the birds themselves.

Chicken-mite, or **Poultry-tick**, a small mite (*Dermanyssus gallinæ*) which gathers on fowls at night and sucks their blood. It is about one millimeter high, light gray, with dark patches, but red when gorged with blood. It swarms in cracks and corners of the henhouse, and should not be confounded with the bird-tick (*D. avium*).

Chicken-pox, an acute, specific, infectious disease, characterized by a definite incubation period, an eruption of successive crops of vesicles which persist for a certain length of time, and a well-marked clinical course of short duration. It is one of the mildest of the eruptive fevers. The disease is usually epidemic, but sporadic cases do occur. It very frequently accompanies small-pox, and great care must be exercised not to confound mild cases of small-pox with severe cases of chicken-pox. The stage of incubation is usually about eight days, although it may vary from 8 to 18 days. The child may be feverish in some cases, have a slight chill, pain in the back and legs, nausea and vomiting. The eruption usually develops within 24 hours after the first onset. There are first raised red papules which in a few hours are transferred into raised hemispherical vesicles filled with clear serum. At the end of 36 to 48 hours, this clear serum may become purulent, and the vesicles then begin to shrivel, and in from three to four days are changed to dark-brown crusts which fall off and rarely leave a scar. Fresh groups occur during the first two or three days of the illness; as a rule they are not very many in number. In delicate children the number may be large, and gangrene may set in unless great care is taken in the treatment of the vesicles. Chicken-pox is very contagious, but is not dangerous, and the first treatment should be the complete isolation of the patient.

Chicken-snake, a name given in the northern United States to the *Coluber eximius*, *C. quadrivittatus*, or *Ophibolus eximius*. The head is short and the snout rounded; the nostrils are lateral, the eyes large, with a dusky pupil and gray iris; the neck is contracted, the body long but robust, covered with smooth, small, hexagonal scales above, and broad plates below; the tail is short, thick, soon becoming cylindrical, and ending in a horny tip. The color is milky white above, sometimes tinged with red; along the vertebral line is a series of dusky oval spots bordered with black, sometimes giving the appearance of transverse white and black bands. Alternating with these bands on the sides is another series of smaller rounded and blacker spots, and sometimes a third smaller series lower down. The upper lip is milky white; the abdomen is silver white, sometimes yellowish, each plate marked with one or two black, quadrilateral spots, near the centre if single, and near the margins if double, giving a tessellated appearance. It grows to the length of five feet. It is perfectly harmless; from its frequenting houses and dairies it has been called "house

CHICKEN-TICK — CHICORY

snake" and "milk snake." It feeds on frogs, toads, mice, insects, and small birds. It does not appear to be found below lat. 37° N.; westward it extends to the Mississippi. It prefers shady and rocky places. The chicken snake of the south is *Scotophis quadrivittatus*; the body is very long; above, a greenish clay color, with four longitudinal brown bands; yellowish beneath; scales on the back ridged; and on the sides smooth; the head is quite distinct; the tail is one fifth the whole length; body three and a half feet, and tail 10 inches. It is said to attain a length of seven feet. It is found from North Carolina southward, and to the Mississippi; it destroys rats, young chickens, and small animals, but its bite is harmless to man. It is sometimes found on trees.

Chicken-tick, an arachnid of the family *Argasidæ*, and related to the mites, but very much larger. Originally an inhabitant of tropical America, this tick (*Argas miniatus*) has been found to annoy poultry in Texas and Florida. It is about a quarter of an inch long, usually very flat, unless gorged with blood. The surface of the body differs from that of other ticks in having scattered pits with a raised edge; it also differs from ordinary ticks in the head being covered by the body, in the spiracles being placed between the third and fourth pairs of legs, and in having no pulvillum between the claws. It was originally found in Texas among ordinary ticks taken from cattle. The young is six-footed. Of 10 other species of *Argas*, *A. reflexus* of the Old World lives on pigeons and occasionally attacks man; the Persian *Argas* (*A. persicus*) in Persia attacks man and poultry.

Chick'ering, Jonas, American piano maker: b. New Ipswich, N. H., 5 April 1797; d. Boston, Mass., 8 Dec. 1853. The son of a blacksmith, he received only a common school education, and in 1819 entered a piano manufactory in Boston, Mass., conducted by John Osborn, later going into business for himself. At that time the making of a piano was an event of sufficient importance to receive extended public mention, and the first instruments made by Chickering and his contemporaries were works of art. Before his death his Boston factory was turning out 2,000 pianos a year. The firm has been carried on continuously by his sons, and their pianos have a high reputation among musicians everywhere. Some of the most important developments in pianoforte construction have first been introduced in the Chickering piano.

Chick'weed (*Alsino media*), an annual plant abounding throughout the world in ill cultivated or neglected places. It is botanically related to the corn-cockle or *Agrostemma*, belonging, like it, to the natural order of the *Caryophyllacæ*. It grows in waste places throughout North America, and may be used when young as a substitute for spinach and other greens.

Chiclana, chē-klä'nä, Spain, a town in Andalusia, 12 miles southeast of Cadiz. It stands in a plain on both sides of the Lirio, and about a mile northeast of Barrosa, famous for the defeat of the French, under Marshal Victor, by the British under Gen. Graham, in 1811. It consists of well built houses of hewn stone, white as snow, and generally enclosed by gardens. The principal buildings are a magnificent

hospital, two parish churches, and a large and well-decorated theatre. The manufactures consist of linen, starch, earthenware, and other articles, and there is a considerable trade in corn, wine, and fruit. The baths of Chiclana, which have a temperature of 60°, and are said to be very efficacious in cutaneous affections, are much frequented. Pop. 12,348.

Chiclayo, chē-klä'yō, Peru, a city in the northwest on the coast, is near a valuable sugar district, and the shipping of the sugar is its chief occupation. Pop. 14,000.

Chicle-gum, chēkl- or chē'klä-, an elastic gum produced by the bully-tree, naseberry, or sapodilla (*Achras sapota*), a native of South America. It is largely imported into the United States for the purpose of being manufactured into chewing-gum.

Chico (chē'kō) **Series**, the Upper Cretaceous rocks that originally extended in a broad belt from Lower California northward beyond the Queen Charlotte Islands, and covered the region of the Coast and Cascade ranges. The lower portion of the Chico beds comprises sandstones and conglomerates chiefly, and is from 900 to 1,400 feet thick. The upper portion is mostly shale with some sandstone. The greatest thickness of the whole series in Tehama county, Cal., is nearly 4,000 feet. On Vancouver Island the Nanaimo beds of Chico age contain valuable seams of coal. The fossils show a fauna related to that of southern Asia rather than to the interior American continent. See CRETACEOUS SYSTEM.

Chic'opee, Mass., city in Hampden County, on the Connecticut River, at the mouth of the Chicopee, four miles north of Springfield, and on the Boston & Albany, and Boston & Maine R.R.'s. It is connected with Holyoke and Springfield by electric street railway lines. The former villages of Chicopee Falls, Willamamsett, and Fairview are now included in Chicopee city, which has manufactures of cotton, artillery, bronze, bicycles, rifles, swords, paper, etc. Manufacturing power is furnished by the Chicopee River. It contains numerous churches, public and parish schools, national and savings banks. Pop. (1900) 19,167.

Chicopee River, rises in Worcester County, Mass., flows south southwest into Connecticut River. It has an abundance of water power which is utilized for manufacturing by the numerous towns on its banks.

Chic'ory, or **Succory**, a perennial herb (*Cichorium intybus*) of the natural order *Compositæ*. It is a native of Europe which has become naturalized in many parts of the world, having escaped from gardens in which it is often grown as a pot-herb and salad, or for its roots, which, while young, are used like carrots. In many places it has become troublesome as a weed. The plant may be cultivated like other root crops upon rich, deep, well-drained soil. It resembles dandelion in its leaves, but the perennial roots send up a branched flower-stem which bears leaves of various shapes and flowers of various colors, blue predominating, but pink and white not being uncommon. Besides the use of the root leaves in a green state for salads and as a boiled vegetable, the roots are made to produce two important salads,

CHICOUTIME — CHIGI

witloof and *barbe de capucin*. For these they are dug late in autumn and trimmed of their leaves and superfluous branching roots, and buried in sand or soil in a dark cellar. For witloof, or white leaf, they are stood in a vertical position and covered with several inches of fresh manure or tanbark packed hard; for *barbe de capucin*, they are laid horizontally in pyramidal heaps, a layer of soil and one of roots alternating. In both cases the soil is moistened and the temperature kept uniform. In two or three weeks small heads form in the first case, and long white leaves in the second. Chicory is much more widely grown for its roots, which are used as a substitute for and an adulterant of coffee. The roots are dug, washed, sliced, dried in kilns, roasted in coffee-roasters, ground, and marketed in bulk, in packages, and in sticks. Among the foreign-born population chicory is largely used as a beverage, and since American fields do not supply the demand it is imported from Europe, where the use originated during Napoleon's time. As an adulterant chicory is far less used than is popularly supposed. Its presence may be easily detected by placing a little of the suspected article in a glass of water. Chicory will soon sink and stain the water brown; coffee will float for a long time and then scarcely discolor the water.

Chicoutime, shē-koo-te-mē, Dominion of Canada, county of the Quebec province, formed from Saguenay in 1853. Several smaller sheets of water are scattered over its surface, and the Saguenay intersects it, receiving in its course several small tributaries. The surface is rocky, rough, and broken, but near the streams are fertile and cultivated strips. A great deal of lumber is cut and sawed on the small streams emptying into the Saguenay. The Hudson Bay company have several stations in the county. Capital, Chicoutimi. Pop. 23,760.

Chief Justice, the title of the presiding justice of the supreme court of the United States, and of the presiding justice of the several State supreme courts. Various other courts in the United States are also presided over by a chief justice. The following is a list of the persons appointed as chief justice of the supreme court of the United States from its establishment, some of whom, however, being rejected by the Senate, or, declining the position, never served:

John Jay, of New York, appointed by Washington 26 Sept. 1789; resigned 1791.

John Rutledge, of South Carolina, appointed by Washington 1 July 1795; rejected by the Senate 15 Dec. 1795.

William Cushing, of Massachusetts, appointed by Washington 26 Jan. 1796; declined promotion from his associate justiceship.

Oliver Ellsworth, of Connecticut, appointed by Washington 4 March 1796; resigned 1800.

John Jay, of New York, appointed by John Adams 19 Dec. 1800; declined.

John Marshall, of Virginia, appointed by John Adams 31 Jan. 1801; died 6 July 1835.

Roger Brooke Taney, of Maryland, appointed by Jackson 15 March 1836; died 12 Oct. 1864.

Salmon Portland Chase, of Ohio, appointed by Lincoln 6 Dec. 1864; died 7 May 1873.

George H. Williams, of Oregon, appointed by Grant 1873; rejected.

Caleb Cushing, of Massachusetts, appointed by Grant 1873; rejected.

Morrison R. Waite, of Ohio, appointed by Grant 21 Jan. 1874; died 23 March 1888.

Melville W. Fuller, of Illinois, appointed by Cleveland 20 July 1888.

Chief Justice, or **Lord Chief Justice**, in England; the presiding judge in the king's or queen's bench division of the high court of justice, and, in the absence of the lord-chancellor, president of the high court, and also, *ex officio*, one of the judges of the court of appeal. The chief justice of the court of common pleas, previous to 1881, was the presiding judge in the common pleas division of the high court of justice, but the office is now merged in that of the chief justice of England. The title chief justice is also generally given in the various British colonies to the heads of the different judicial establishments, as in Canada, Australia, etc. In Canada there is not only a chief justice at the head of the supreme court of the Dominion, but also chief justices in the separate provinces.

Chief of Staff. See GENERAL STAFF OF THE UNITED STATES ARMY.

Chiemsee, hēm'zā, the largest lake in Bavaria, circle Isar, district Trostberg, 48 miles southeast of Munich; greatest length, 10 miles; greatest breadth, 9 miles; area, 74 square miles; depth, about 480 feet. It is of an irregular shape, very much indented, and contains three pretty islands—Krautinsel, Herrenwörth, and Frauenwörth.

Chieri, kē-ā'rē, Italy, in the province of Turin, eight miles east-southeast of the town of Turin. It is walled and well built, contains the largest Gothic church in Piedmont, with a very ancient baptistery, and at a very early period became celebrated for its manufactures of fustian, which are still flourishing. Pop. 10,000.

Chieti, kē-ā'tē, Italy, capital of province of same name, on a hill near the right bank of the Pescara. It was anciently one of the largest and most important towns in this part of Italy, and was for some centuries in possession of the Greeks, from whom it passed successively to the Romans, Lombards, Franks, and Normans. In 1802 it was taken by the French troops. The modern town, which is well built and adorned with several handsome edifices, is the see of an archbishop and the seat of a superior civil and criminal court, and has manufactures of woollens, and a trade in silk, wine, wheat, and oil. Pop. 12,273.

Chiff-chaff, a small European bird (*Sylvia hippolais* or *Phylloscopus collybita*), of the warbler family (*Sylviidae*), so named from its cry. Its head, back, and upper wings are ashy brown, and its under parts are brownish green dashed with yellow. In length it is between four and five inches, and it frequents woods, hedges, and thickets. Its food consists of the larvæ of various insects and some of the smaller moths.

Chigi, kē'jē, a noble Italian family, founded by AGOSTINO CHIGI (d. 1512) of Siena. He became a patron of the fine arts and banker for the Pope. (See Cugnino's 'Agostino Chigi il Magnifico.') FLAVIO CHIGI (b. 1810) was one

CHIGNECTO — CHIHUAHUA

of the papal guard until 1848, when he was made Bishop of Mira *in partibus*, nuncio at Munich, but was sent to Paris (1873) and later made cardinal, d. 15 Feb. 1885. The head of the family is Prince of Campagnano and Due of Ariccia. He is also hereditary marshal of the conclave.

Chignecto (shĭg-nĕk'tō) **Bay**, an inlet at the head of the Bay of Fundy, in the Dominion of Canada. It separates Nova Scotia from New Brunswick, is 30 miles long and 8 broad, and has an isthmus of only 14 miles in width between it and Northumberland Strait, in the Gulf of St. Lawrence.

In October 1888 work was begun on the construction of a ship railway across the neck of land connecting Nova Scotia with the main land of Canada, under the encouragement of an annual subsidy from the Canadian government. The promoters had spent nearly \$4,000,000 on the work, when in 1890 a financial depression in London prevented them from obtaining further capital. As the subsidy from the Canadian government was to be payable on the completion of the work in a given time, the contractors were unable to secure any aid from that source. In March 1901 the undertaking was revived. The railway was projected to be 18 miles long, and by uniting the Gulf of St. Lawrence with the Bay of Fundy and the waters of the Atlantic Ocean, a run of several hundred miles around the province would be saved.

Chignon, shĕn-yōn, a peculiar arrangement of the hair, worn by women, a knot or mass, natural or artificial, arranged low on the back of the head, at the nape of the neck. It comes from a French word meaning link or chain. This style of hair-dressing was common in the 18th century, but fell into disuse, was revived in the last half of the 19th century, not now in vogue.

Chigoe, chĕ'gō. See JIGGER; SARCOPSYLLA.

Chihuahua, chĕ-wā'wā, Mexico, a state bounded on the north by the United States, on the east by Coahuila, on the south by Durango, and on the west by Sinaloa and Sonora. It is the largest of the Mexican states, having an area of 227,468 square kilometres, or about three times that of the State of New York. The Sierra Madre range traverses the state, and the Sierra de Tarahumares lifts its peaks (Bufo de Cerro Prieto, Jesús y Maria, Mesa de Tabascotes, etc.) to a considerable height; otherwise the surface is an undulating table-land, the elevation of which varies from 3,500 to 7,000 feet above sea-level. The largest of the elevated plains lying between the mountain ranges are the Chilicote, Gigantes, Bolsón de Mapimi, etc. The Rio Grande forms the northern boundary, separating the state from the United States; but this river, which rises in Colorado and flows through New Mexico, is almost dry by the time it reaches Mexican territory, the greater portion of its waters having been utilized for the irrigation of lands in the country of its origin. (See MEXICO—THE STATES OF.)

Chihuahua, Mexico, capital of the state of the same name, the northern border of which forms the dividing line between Mexico and the United States, and one third of the width of the

first named country. Probably the most Americanized city of equal importance in the Republic. Altitude 4,973 feet above sea level. Distance from the United States border at El Paso, Texas, 225 miles and from Mexico city, 999 miles. Is well provided with transportation facilities, being on the lines of the Mexican Central and Kansas City, Mexico & Orient railways, and the initial terminal of the Chihuahua & Pacific railway. Is the centre of one of the most important stock raising and mineral producing districts south of the Rio Grande. Is the first point of importance reached in the journey from the northern boundary of the country to the City of Mexico. It is an important supply point for miners whose properties are situated in the mountain regions to the west and southwest. Among the manufacturing establishments of the city are extensive rolling mills and iron works, a brewery, a soap factory, a manufactory of clothing, broom factory, mineral water factory, manufactory of agricultural implements and various smaller industries. An extensive smelter is being built and a number of other new industries are contemplated. A few miles distant from and connected with the city by railway, are the Santa Eulalia Mineral Springs and health resort, for which great merit is claimed. The principal buildings of a public character are the new Penitentiary; the old Cathedral, completed over two hundred years ago by the contributions of a rich miner, at an outlay of almost \$1,000,000, the recently built Opera House, one of the largest and finest in the republic; the Government Palace, the palatial home of ex-Governor Ahumada; the new Municipal Palace and the Mineral Bank. It was here that the Patriot Hidalgo suffered imprisonment and was executed in 1811. The tower or dungeon in which he was confined is sacredly preserved and will ever be reverently visited by tourists. In the plaza adjoining the Government Palace a splendid monument has been erected in his honor. The Alameda, situated in the business centre, is utilized on Sunday evening of every week by all classes as a promenade, the occasion being always enlivened by excellent music provided by the state government. An aqueduct built over 200 years ago conveys water into the city, and a modern built street railway provides means of local transportation. A museum of minerals recently established by the state has already become one of the city's chief places of interest. Advanced methods of primary education are receiving much attention, both from the state and municipal governments, and higher education is provided by a normal school for young women, a college for young men and a number of clerical and other institutions of advanced instruction. A library connected with the Preparatory School contains 6,000 volumes. The principal scientific organization is devoted to the study of medicine and is known as the "Medica Mutualista." The social advantages include an American club, two Mexican clubs and a number of literary and society organizations. Financially, Chihuahua is one of the best equipped cities in the Republic. It has four local banks,—the Mineral Bank, with a capitalization of \$5,000,000, the Chihuahua Exchange company, the Chihuahua Investment company and the Commercial Bank; besides which there

CHILAN BALAM — CHILD-LABOR

are branches of the National Bank and the Bank of Sonora, and an agency of the Bank of London and Mexico. Pop. (1906), 35,000.

Chilán Balám, chē-lān' bā-lām', **Books of**, a series of Maya writings which have been preserved, supposed to have been written by a Maya priest by the name of Chilán Balám. They concern the life of the people before the arrival of the Spaniards; and it is said that the author prophesied the coming of a strange people.

Chi'law, Ceylon, a town on the west coast, near the mouth of the Dederoo-oya, 45 miles north by west from Colombo. Its proximity to the pearl-fisheries gave it an interest which it did not otherwise possess, and made it repeatedly the object of a keen contest. The Tamils wrested it from the Singhalese in the 14th century, and it afterward passed successively to the Moors, the Portuguese, and the Dutch. From the last it was taken by the British in 1796. In the forest to the east of Chilaw, within a radius of 20 or 30 miles, are contained the ruins of a number of ancient cities. The road leading from Chilaw southward to Negombo passes through almost continuous cocoanut plantations. Pop. 5,000.

Chilblain, or **Frostbite**, a mild or severe inflammatory reaction from the effects of severe cold on the toes, fingers, nose, chin, ears, etc. In mild cases there is swelling only, with an inflammation of the skin. This disappears and the part is apt to be tender. In severe frostbite there is ulceration and sloughing of the part. The treatment of mild chilblain is by slow raising of the temperature of the chilled part to that of the body. Too rapid heating results disastrously. Special clothing may be necessary for the tenderness, particularly of the feet.

Child, Francis James, American scholar and educator: b. Boston, Mass., 1 Feb. 1825; d. Cambridge 11 Sept. 1896. He was professor of rhetoric and oratory at Harvard from 1851 till 1876, when he exchanged for the chair of English literature. His principal work, 'English and Scottish Ballads,' a subject on which he was the highest authority in this country, he improved and enlarged for publication in 1886. Among his other works are 'Four Old Plays' (1848); a collection of 'Poems of Sorrow, Comfort, Counsel, and Aspiration' (edited 1865); and 'War Songs for Freemen' (edited 1862).

Child, Frank Samuel, American Congregational clergyman: b. 20 March 1854. He was educated at Hamilton College, N. Y., and after graduating from Union Theological Seminary in 1878 was ordained to the ministry. Since 1888 he has been pastor of the First Church of Fairfield, Conn. He has published 'An Old New England Town' (1895); 'The Colonial Parson of New England' (1896); 'A Colonial Witch' (1897); 'A Puritan Wooing' (1897); 'The House with 60 Closets' (1899); 'An Unknown Patriot' (1899); 'The Little Dreamer's Adventure' (1900); 'Friend or Foe' (1900).

Child, Sir Josiah, English merchant: b. London 1630; d. there 1699. The work by which he is known is entitled 'Brief Observations Concerning Trade and the Interest of Money, by J. C.' (London 1668). An enlarged edition

was published in 1690, under the name of 'A New Discourse on Trade.' The work has been several times reprinted. It was written in defense of the reduction, by legal enactment, of the rate of interest on money from 8 to 6 per cent, and recommends a further diminution to 4 per cent. He was for some time chairman of the East India Company, and wrote several papers, without signature, in defense of the traffic with the East, arguing, in opposition to those who complained of the drain of coin, that the India trade percolated through other countries with which Britain traded, and thus returned indirectly a surplus in cash. In his essay on trade he advocated the compulsory emigration of paupers to the colonies, and suggested the appointment of corporate officers called "fathers of the poor" to superintend those who were left. He became very wealthy, and his children, by three marriages, allied themselves with the highest nobility. Charles II. made him a baronet. His son became Earl Tylney, but the title is now extinct.

Child, Lydia Maria Francis, American prose writer: b. Medford, Mass., 11 Feb. 1802; d. Wayland, Mass., 20 Oct. 1880. She was married to David Child, a Boston lawyer, in 1828. Her first novel, 'Hobomok,' was written and published in 1821. She was an ardent abolitionist, and published one of the first anti-slavery books, entitled 'Appeal for that Class of Americans Called African,' one immediate result of which was the loss of her former literary popularity in the southern States. From 1841 to 1844 she and her husband edited the 'National Anti-Slavery Standard.' Among her numerous works are 'The First Settlers of New England' (1829); 'Philothea, a romance of Greece in the days of Pericles' (1835); 'Fact and Fiction' (1846); 'Isaac T. Hopper: A True Life' (1853); 'Progress of Religious Ideas' (1855); 'Looking Toward Sunset' (1864); 'Miria: A Romance of the Republic' (1867); and 'Aspirations of the World' (1878). A collection of her letters, with an introduction by John G. Whittier, and an appendix by Wendell Phillips, was published in 1882.

Child-labor. The growth of child-labor is coincident with the introduction of machinery and the development of the factory system. Arkwright obtained his first patent for a machine for spinning cotton yarn in 1769, which immediately resulted in taking the manufactures out of the English cottages and farmhouses. Compton's spinning mule followed in 1775, Cartwright's power loom in 1787, and Eli Whitney's famous cotton-gin in 1793. The sudden displacement of home labor, the rapid development of manufacturing, and the substitution of mere mechanism for the skill of the individual operative, resulted in a demand for cheap child-workers. The employment of children soon became general, and large numbers were crowded together in factories, before the change had attracted much attention. It began with the apprentice system, the children being procured from the poorhouses of London, Birmingham, and southern England.

"Agreements of the most revolting character were often made between the manufacturers and the different parish workhouses for bands of children for a number of years, in which the condition of the children was totally disre-

CHILD-LABOR

garded. Such, for example, were those provisions whereby it was agreed that with every 20 sound children one idiot should be taken." (William F. Willoughby, American Economic Association, March 1890.) In 1784 the magistrates of Lancashire passed a resolution that apprentices should no longer "work in the night or more than 10 hours in the day." No protection was provided for children who were not parish apprentices, and no inspection was established, so that the resolution had no force, and remained a dead letter. In 1802 Sir Robert Peel, Sr., secured the passage of a bill abolishing the apprentice system, so far as the cotton factories were concerned. This mild measure met with bitter opposition from the manufacturers, and was of very little immediate benefit, but it was valuable as the first definite step to awaken public sentiment to the evil. According to Walker (Political Economy): "The beginning of the present (the 19th) century, found children of five and even three years of age in England working in factories and brick-yards; women working underground in mines, harnessed with mules to carts, drawing heavy loads; found the hours of labor whatever the avarice of individual mill-owners might exact."

In 1815 a parliamentary committee was appointed to "inquire into the expediency of extending the Apprenticeship Act to children of every description." During the next three years reports were presented which showed that the children employed were worked to the point of exhaustion, and that their condition was worse than slavery. In 1819 an act was passed forbidding the employment of children under 9, and the hours of labor for those between 9 and 16 were limited to 12 hours a day. In 1833 Lord Ashley, afterward Earl of Shaftsbury, introduced a bill which extended the provisions of former acts, and stipulated that inspectors should be appointed to enforce the law. During the following years until 1878 various progressive steps were taken, under the able championship of such men as Lord Shaftsbury and Robert Owen. The act of 1878 was the culmination, and is still regarded as an admirable code for factory legislation. It prohibits the employment of children under 10, and those under 14 may only be employed half time. Night work is forbidden, and children under 16 must furnish medical certificates of fitness for employment. Weekly certificates must be obtained, showing the required amount of school attendance.

During the first half of the 19th century, every political economist opposed factory legislation, and the employers were practically unanimous in their opposition to any abridgement of their right to employ children. The motives of the early reformers were exclusively humanitarian, and they advocated the necessity of protecting women and children because they are not "free agents." It is, however, generally conceded now that the real grounds of state interference with, and regulation of industry are considerations of the safety and well-being of the community. In accordance with this principle, acts were passed in 1891, 1895, 1898 to regulate home work, to prohibit the employment of women for one month after the birth of a child, to prevent and define overcrowding in future, and to minimize the evils of danger-

ous trades and occupations. A whole code of special rules for each dangerous trade has been formed by the home secretary, to enforce precautions for the protection of the workers, and an arbitration court is provided for the adjustment of protests. According to Thomas Oliver, "Experience shows that there is scarcely a dangerous trade from which, with extreme care and attention to regulations, the dangerous influences cannot be largely removed."

Perhaps the most marked difference between the development of child-labor legislation in Great Britain and in the United States, is this—that in Great Britain, a knowledge of the conditions has always preceded legislation, whereas in many of the American States legislation has been hasty and ill considered, and frequently in advance of public information and public sentiment.

Social legislation which affects industrial interests must be supported by an intelligent public opinion, which has been educated to believe that a state of evil exists, and that the remedies proposed are really necessary. The mere passage of a law may have a certain educational value, but it cannot be enforced without a public conviction of its value. In 1889 Mrs. John Armstrong Chanler offered a prize, through the American Economic Association, for the best essay on child-labor. The prize was divided equally between William F. Willoughby and Miss Clare De Graffenried, both of whom were connected with the Federal Department of Labor, and their essays are still the best general source of information as to the conditions in the United States. Mr. Willoughby says that in England "the regulation of factories and labor is the single duty of the central government, while here it falls to the different State legislatures. As a consequence, while throughout England the laws are uniform, and but one set of statutes and reports, those of Parliament, which are easily accessible, have to be studied; here no two States have the same laws; only a comparatively few have any at all; and information must be obtained through the various bureaus of labor or the reports of the inspectors of factories and workshops. . . . These reports are often unsatisfactory, and are confessedly unreliable. Each department is conducted in its own way. Some, with adequate means, are well organized, and their reports are of the greatest possible value, while others, with very limited resources, can do but feeble work. The law creating them has, in most cases, been inadequate and too timid." He adds that in no case can the statistics of one State be compared with those of another, and that the reports of the State bureaus are in most cases incomplete, "owing to the refusal of the factory owners to make returns or the gross falseness of many of those which were made." At the time Mr. Willoughby wrote (1889), the following States had organized labor bureaus: Massachusetts, 1869; Pennsylvania, 1872; Ohio, 1877; New Jersey, 1878; Illinois and Indiana, 1879; New York, Michigan, Wisconsin, Missouri, and California, 1883; Iowa and Maryland, 1884; Connecticut and Kansas, 1885; Rhode Island, Maine, Colorado, Minnesota, North Carolina, and Nebraska, 1887. In the 14 years which have intervened since Mr. Willoughby wrote, the following States have established bureaus of labor statis-

CHILD-LABOR

tics, or have provided for factory inspection, or have legislated in some way for the regulation of child-labor, namely, Alabama, Arkansas, Kentucky, Louisiana, Montana, North Dakota, Oregon, South Carolina, South Dakota, Tennessee, Texas, Virginia, Washington, and West Virginia; and legislation is now pending in the State of Georgia. There has been a great awakening of public sentiment on the subject of child-labor during the last few years and at the present time the general interest is intense. The governors of seven different States have referred to it during the past year in their annual messages, and in one form or another bills to regulate child-labor or amend former laws have been introduced recently in most of the manufacturing States. Much of this legislation is for the purpose of improving the administration of the departments of inspection, which is almost as lax as it was 14 years ago. Very little progress has been made in the compilation of data on child-labor. The writer has recently examined the reports for 1901 and 1902 of the various State bureaus of labor statistics and factory inspection, and can confirm literally to-day Mr. Willoughby's findings of 14 years ago!

In a number of the manufacturing States child-labor laws were first passed at the instance of the labor organizations, and for the purpose of placating the "labor vote." Many of the States have failed to make adequate provision for the cost of inspection, and only a few of the inspectors have been men of trained observation, or men whose previous experience has been such as to fit them in any way for the exacting duties of their office. In some States the department of factory inspection has simply been the football of politics, and the inspectors have been changed with each administration; while in others, the "spoils" have fallen to local labor leaders, who have been placed in positions of great responsibility, overloaded with diverse duties, and allowed a free hand without any supervision. For some reason or other, the laws for the regulation of child-labor have been fully enforced in a few of the States only, and much of the available data as to the number and ages of the children employed, is still very unreliable. The figures of the 12th census (1900) quoted below, may be taken as a minimum estimate only, since they are based on schedules filled out by the manufacturers themselves, at their own discretion, without any verification of the census taken. In fact, the director of the census says himself:

"The limitations connected with the taking of a great national census preclude proper care upon the question of child employment. There is a great uncertainty as to the accuracy of a mass of information of this character taken by enumerators and special agents, who either do not appreciate the importance of the investigation, or find it impracticable to devote the time to the inquiry necessary to secure good results. Again, the answer to the question, 'average number of children under 16 years of age,' may have been inconsiderately given, or, if considered, answered more as the word 'children' was construed by the individual than according to the interpretation intended by the schedule to be placed upon it. The word 'children' to manufacturers has many meanings, in accordance with the geographical location of their

plants, or the character of the work performed."

According to the census, the average number of children under 16 years of age (evidently including only those in factories) earning wages in 1900 was as follows:

States	No. children	States	No. children
Alabama	3,474	Missouri	4,510
Arizona	38	Montana	112
Arkansas	643	Nebraska	776
California	2,114	Nevada	20
Colorado	243	New Hampshire....	1,651
Connecticut	3,479	New Jersey.....	8,042
Dakota	6	New Mexico.....	29
Delaware	859	New York.....	13,189
District of Columbia	116	North Carolina....	10,377
Florida	374	Ohio	4,369
Georgia	6,373	North Dakota.....	37
Hawaii	40	Oregon	38
Idaho	23	Pennsylvania	33,135
Illinois	10,419	Rhode Island.....	5,036
Indiana	3,618	South Carolina....	8,560
Indian Territory...	16	South Dakota.....	114
Iowa	1,888	Tennessee	2,171
Kansas	860	Texas	1,041
Kentucky	2,687	Utah	218
Louisiana	1,321	Vermont	263
Maine	2,202	Virginia	4,164
Maryland	5,884	Washington	265
Massachusetts	12,556	West Virginia.....	840
Michigan	2,636	Wisconsin	5,679
Minnesota	792	Wyoming	15
Mississippi	1,049	United States.....	168,623

According to the United States agent of the Department of Labor, Mr. Wm. Waudby, there were approximately 860,700 children between the ages of 10 and 15 years employed in various "gainful occupations" in 1880 in the United States; in 1890 that number had grown to 1,750,000!

Miss De Graffenried's essay, referred to above, is still the best available statement of conditions of child-labor in many manufacturing industries, notably corset factories, box factories, packing houses, and tobacco and woolen manufacture. In 1891 she wrote an article (based on personal investigation) dealing with the deplorable conditions of child-labor in the southern cotton mills, which excited violent controversy in the South (Century Magazine, February 1891), but her assertions have been fully confirmed during the past two years by the child-labor committees of Alabama and Georgia. In the same way the statements made by Miss De Graffenried in her prize essay as to the evils of child-labor in the sweat-shops, and in the large department stores and mercantile establishments, have been completely verified by the subsequent investigations of the New York Tenement House Commission and the National Consumers' League. The determined and successful fight waged by the Alabama Child-Labor Committee, under the direction of Mr. Edgar Gardner Murphy of Montgomery, Alabama, for the passage of a law to forbid the employment of very young children, deserves special mention. His printed arguments are a part of the permanent literature of child-labor, and created such a wave of public sentiment, that the organized and powerful opposition of the cotton mill owners was finally overcome and the legislature forced to yield to the popular pressure. The owners of the cotton mills in Georgia put forward the plausible plea that compulsory education laws should precede legislation to prevent employment of children under 12. The effect of this would simply be to postpone action for another generation, since the State cannot afford to provide sufficient schooling

CHILD-LABOR

facilities until its resources increase in value, or its pensioners die off. At present Georgia is burdened with an annual pension tax of nearly \$1,000,000, and the misfortunes of the parents are reflected in the ignorance of their children. In this connection the following deductions from the census of 1900 are interesting:

	White Children of School Age 5 to 20.	White Illiterates of 10 years and over.
Alabama	394,152	104,883
Georgia	457,958	101,264
North Carolina	490,782	175,917
South Carolina	218,323	54,719
Virginia	435,612	98,160

One main cause of the extent of child-labor abuses in the southern cotton mill States is the general lack of vagrancy laws. The "poor white" is shiftless and lazy, and will not work indoors, and in the general exodus of his family to the factory towns, he has been left out of the calculation. His wife and children find their way into the factories, while he exists on the proceeds of their labor. An action for non-support is almost unknown, and not only is there no apparent remedy for the evil, but the State by its failure to prevent the slavery of his children, puts a premium upon the idleness of the parent! Of course the enforcement of compulsory education laws, in conjunction with a simple educational test for children of school age who seek employment, is a powerful aid to the factory inspector. Indeed the State of New Hampshire controls the whole matter by giving its truant officers the right to enter all mechanical, mercantile, and manufacturing establishments, and make a rigid examination; and so far has not found it necessary to employ a factory inspector. But it is reasoned that if, in a community where free schooling is lacking, the factory owners were forbidden to employ children who cannot read and write, the practical result would be to induce the parent to provide for his children's education, in order that they might the sooner qualify as wage-earners.

The child-labor committee of New York has just won a similar victory in securing the passage of laws to license newsboys, and to protect telegraph, messenger, and delivery boys. This movement originated with the social settlement workers, whose daily life brought them into contact with the actual conditions of the "street boy." The report of this committee also is very valuable.

During the past winter the Anthracite Coal Strike Commission developed the fact that large numbers of children under the statutory age were employed in the coal mines and silk and knitting mills of Pennsylvania, under most distressing conditions. As the result of the commission's investigation, bills were introduced to raise the age limit of breaker-boys to 14, and of mine employees to 16, and to abolish the night work of little girls in mills and factories. The first two measures were supported jointly by the coal operators and their employees, and were passed. The other measure failed, but the various women's organizations of Pennsylvania have taken the matter up, and have organized a committee of citizens to fight for legislation and to see that existing laws are rigidly enforced.

The problems of child-labor are now engrossing the attention, not only of the econo-

mists, but of those who are engaged in studying the causes of social disorder, and seeking to prevent pauperism and disease. Charity workers have found that child-labor is wrapped up and interwoven with many of the problems of disease, of crime, and of dependence, and the Thirtieth National Conference of Charities and Correction, which met in Atlanta, Ga., May 1903, devoted two notable sessions to the discussion of 'Child-Labor as a National Problem.' The addresses and discussions will be published in the proceedings of the conference. The sixth annual meeting of the American Academy of Political and Social Science was also largely devoted to the subject, and the annals of the academy for July 1902 contain the papers which were read. The women's clubs are also agitating the subject continually, and the labor men no longer have to fight alone for the passage and enforcement of child-labor laws. In almost every State a strong body of public sentiment is being brought to bear upon the subject, and there is general demand for a thoroughly scientific investigation of existing conditions, and better facilities for regulating the employment of children.

The State of Massachusetts has hitherto supplied the standard of statutory law and administration in this department, but Mrs. Florence Kelley is now heading the forward movement for better methods, and her article in the Annals of May 1903 on 'An Effective Child-Labor Law' may be taken literally, as she suggests, as 'A Problem for the Current Decade.'

A careful study of the status of child-labor in Europe, as made by Miss Edith J. Rich, reveals the fact that "no state is without some protection against this evil, and no state affords a protection even approximately adequate. For a century and a half the separate countries slowly developed a public sentiment against child-labor and formulated laws upon the subject, but harmony of action was not attempted until 1890, when an International Labor Conference was held in Berlin. At this conference it was decided to recommend to every state in Europe the passage of the following law, as a safeguard against industrial decay: That children of either sex not having reached a certain age must be excluded from factories, the age limit to be fixed at 12 years, except for southern countries, where it be fixed at 10. Bald statistics show the following as the present conditions: In Switzerland the age limit is 14; France and Germany, 13; Hungary, Portugal, Holland, Sweden, Russia, Austria, and Belgium, 12; England, 11; Denmark and Spain, 10; Italy, 9.

But these statistics, unqualified, give no conception of the true state of affairs. England is, in reality, far from the bottom of the list in matter of protection, and Switzerland's position at the head would not pass unchallenged. And this for many reasons. In the first place, the age limit itself is invariable in few cases. In Hungary and Portugal, for example, the limit is fixed at 12, but may be reduced to 10 if the applicant has a medical and educational certificate of fitness, which is not at all hard to obtain. In England, on the other hand, the exception has the contrary effect. The limit is fixed at 11, but this is raised to 13 unless a child can show a proper certificate of education. In Ger-

CHILD-LABOR

many, Denmark, Austria, Norway, Sweden, and Russia, the tendency is also upward rather than downward from a given standard.

The next difficulty in the way of estimating European conditions from statistics, lies in the lack of harmony between child-labor laws and those cognate laws without which the former are ineffective. In Germany, for instance, child-labor is prohibited under the age of 13, and even then, unless the primary education is complete; the system of compulsory education is good; the employer is made liable for all risks, and there are special regulations for the dangerous trades; but the definition of a factory is so indefinite that many important industries escape factory jurisdiction entirely; the system of inspection is so incomplete and the penalties for violation so slight and so seldom enforced that a large and growing number of children are employed. It is said that the Saxon mines are full of children, and that in this same province children five and six years old are employed in the "flat-stitch" trade, earning two and one fourth cents an hour, and working from 10 to 12 hours a day.

Belgium shows much the same result from another cause. The laws are good and the system of inspection is almost unequaled, but compulsory education is unpopular there, and, as is always the case when educational laws do not supplement those prohibiting child labor by offering a substitute employment for the child, the effect of legislation is negatived. There both the parent and employer are made liable for a violation of the law, and 45 trades are absolutely forbidden; but it is the custom to grant exemptions, and the census of 1896 showed that out of 671,596 laborers 76,147 were under 16 years of age. And even these startling figures do not include the workers in the domestic workshops, which are the *bête noire* of child-labor reformers.

These domestic workshops are a relic of a dead system in vogue before the rise of factories where labor is concentrated. They remain to-day in almost every country of Europe practically excluded from factory legislation. The line that divides factories from domestic workshops differs in all cases and is usually so drawn as to exclude from factory jurisdiction large and important industries, whose representatives have power enough to influence legislation. This is especially true in Russia, and is also notable in Belgium, where the entire clothing industry is beyond reach of the child-labor laws. In Austria it takes 20 persons to make a factory; in Italy 10 persons or the use of mechanical motors; in Germany the inspector is free to define an industry as it suits his purpose; in Switzerland the definition is as follows:

1. All industrial establishments where more than five persons are employed and use is made of mechanical motors or where persons under 18 are employed or which present unusual danger to the health or lives of employees.

2. All industrial establishments employing more than 10 persons, whether they present foregoing conditions or not.

3. All industrial establishments employing less than six persons and presenting unusual danger to health or lives of employees or those employing less than 11, but presenting plainly the type of factories.

And yet in spite of this inclusive definition the domestic workshops of Switzerland, which form a large part of Swiss industrial establishments, continue to employ children unmolested. The reason is not far to seek.

Among the leading Swiss industries are watch- and clock-making, the making of paper boxes, embroidery, wood-carving, silk- and cotton-weaving. For centuries these industries have been carried on in the provinces in small establishments, seldom employing more than 10 or 12 persons. In many cases the parent is the employer, and the children the only employees; in others apprenticeship is still in vogue, although that system practically died with the death of the trade guilds. The Swiss federal laws are limited to factories and dangerous trades, the cantons reserving to themselves the right of apprenticeship legislation. In the special Swiss industries, a certain deftness, flexibility and agility are required which can, with difficulty, be acquired by a person who has not begun the work in the early years before the joints and the fingers are stiff and the power to learn mechanically is lost. The conditions necessary to progress in these industries have therefore been an effective barrier to the enforcement of the laws militating against child-labor.

These laws, nevertheless, have by no means been void of good. Their presence on the Federal statute books has caused deep study of the methods by which they might be obeyed without injuring the industries of the country. The result has been the establishment of great trade training schools, still in their incipiency, but offering to the student the largest hope for the future. In Berne, schools are already in active and highly successful operation, where a child may learn a given trade while he is receiving his general education. The system employed in these manual training schools must never be confused with the fundamentally opposite system of half-time employment which has proven distinctly unsuccessful in several countries, notably in England. Until such schools are established, however, or until some substitute for them is found, which shall at the same time displace the domestic workshops, there should be, in every country attempting to protect its children, inhibitory laws which shall make the employer responsible, according to the laws provided for factories, for all work from which he receives the profit, whether such work be done with or without pay (to include apprentices) and whether it be done on factory premises or at home; and, further, making the word "factory," as far as child-labor is concerned, cover every possible industry in which a child may engage.

In this connection it is interesting to note a French law, also recently adopted in Belgium, which forbids the employment of children under the age of 13 as actors or at public exhibitions of any kind, and further prohibits those under 16 from becoming acrobats or professional beggars. The Belgian law differs from the French in age restriction. In the former country the prohibition extends to all under 18, unless a parent is the employer, when the age limit is 14.

In the matter of night work and in special regulations against the employment of children in dangerous trades, the outlook is more generally hopeful, both in the matter of statutes

CHILD PSYCHOLOGY — CHILDREN

and of their enforcement. Even in Italy 21 trades are absolutely forbidden to children, in Russia 26, and in Belgium 45. Dangerous trades are of two general kinds—those in which the employment of children implies danger to the community, to risk of fire or accident, and those which are dangerous to the worker himself. The latter class is again sub-divided into those in which the danger is inherent or direct, as in the white lead industry, glass-blowing, phosphorus, etc., and those in which the danger is indirect through length of day, employment under ground, and like causes. A notable example of the last class is the mine, child-labor in which is prohibited in almost every country of Europe.

It is almost impossible to make a comparison of the European and American status of child-labor, because neither stands as a unit, being a composite of conditions in various States. The most suitable basis for future reform is harmonious action founded on a study of the universal principles that underlie this great question. What is needed is the universal minimum age limit of 14, which shall remain invariable and impossible of exemption except for unusual cases; a universally accepted definition of factories which shall include every industry in which it is possible for a child to be at work; a universal system of compulsory education to supplement child-labor laws; better factory inspection; stricter enforcement of penalties, and finally, the establishment of great trade schools the world over."

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Child Psychology. See PSYCHOLOGY.

Childbirth. See OBSTETRICS.

Childe Harold's Pilgrimage, a narrative poem in Spenserian stanza, written by Lord Byron (q.v.). It describes the impressions of a young man traveling in southern Europe, and is marked by a tone of melancholy and dissatisfaction. Many have supposed that Childe Harold represented the poet himself. The poem was published in four cantos, the first two appearing in 1812 and the others in 1816 and 1818.

Childebert, shēl-dě-bār or chīl'dě-bērt, three kings of the Merovingian dynasty, France.

1. **CHILDEBERT I.**: b. about 495 A.D.; d. 558. On his father's death in 511 he succeeded to the kingdom of Paris; his brother, Clodomir, king of Orleans, having been killed in battle, Childebert and his brother, Clotaire, king of Soissons, determined to seize and divide his dominions, and murdered his two eldest sons and their followers. Childebert afterward quarreled with Clotaire and laid waste his territory.

2. **CHILDEBERT II.**: b. about 570; d. 596. On the death of his father in 575, he was proclaimed king of Austrasia, and subsequently, by the death of his uncle, Gontran, succeeded to the kingdoms of Burgundy, Orleans, and part of that of Paris.

3. **CHILDEBERT III.**, surnamed the Just: b. about 683; d. 711. He was proclaimed king in 695, on the death of his brother, Clovis III. His kingship, however, was merely nominal, the true sovereign being Pepin le Gros or d'Héristal, who, under the title of mayor of the palace, exercised the real authority.

Childermas (chīl'dēr-mas) **Day** (Feast of the "Holy Innocents"), a festival celebrated by the Roman Catholic Church, 28 December, in commemoration of the massacre of the male children by Herod.

Children, Societies for the Prevention of Cruelty to, organizations that had their origin in New York, and have since been adopted in most American and many European cities. Experience has proved that defenseless children, even within the range of our boasted civilization, are not infrequently grossly maltreated by parents or other legal protectors, and that therefore special legislation is necessary to secure their proper treatment. To ameliorate the condition of children has, therefore, entered largely into the scope of modern legislation. The operations of the societies show in the strongest light the necessity for their action, though it is but a few years since this special agency was introduced. Under seven a child is supposed to be incapable of committing felony. Between 7 and 14 it is held to be *doli incapax*, that is, incapable of crime, while above 14 it is *doli capax*, that is, capable of crime. If, however, anything atrocious be done with obvious malice by a child, it may be held that *malitia supplet aetatem*, malice supplies (the want of) age. The age at which a child can be sworn as a witness depends on the education it has received and its apparent comprehension of the nature and obligation of an oath.

CHILDREN IN THE WOOD—CHILE

Children in the Wood, The, or The Babes in the Wood, an old English ballad, telling the story of two children whom their uncle wished to murder and who were left to die in the woods, by the man who was ordered to kill them. The authorship is unknown, and the date uncertain; it appears in the 'Stationers' Register' of 1595, and was probably written about that time. An old play, published in 1601, has a similar plot, and the source of the two is supposed by some critics to be the same.

Children of the Abbey, The, a once famous romance, by Regina Maria Roche, published in 1798. The Earl of Dunreath, marrying a second time, is induced by the machinations of his wife to cast aside her stepdaughter, for a luckless marriage. It is with the children of this marriage that the story deals. The motherless Amanda is the heroine; and she encounters all the vicissitudes befitting the heroine of the three-volume novel. These include the necessity of living under an assumed name, of becoming the innocent victim of slander, of losing a will, refusing the hands of dukes and earls, and finally, with her brother, overcoming her enemies, and living happy in the highest society forever after.

Children of the Ghetto, a noted book by I. Zangwill, published in 1892. It is, as the author says, "intended as a study, through typical figures, of a race whose persistence is the most remarkable fact in the history of the world." The book raises problems that it does not solve; but the masterly and sympathetic exposition of the Jewish temperament invites a better comprehension of that wonderful race.

Children of Gibeon, a popular novel by Walter Besant, published in 1886. Like his 'All Sorts and Conditions of Men,' it deals with society in both the West and East Ends of London, and their relations to each other. The plot is so ingeniously managed that it seems entirely plausible; the studies of London wage-earners and London slums are faithful, without being too repulsive; and the tone of the book is cheerful, while many social problems are touched in the course of an entertaining story.

Children of the Soil, a novel of modern Polish life, by Henryk Sienkiewicz, published in 1894. There are interesting side issues to the story, involving questions of property, of the social order, of marriage. The work as a whole, although realistic, is sane in spirit, genial and broad in its conception of life and character.

Children of the World, a romance by Paul Heyse, published in 1873. It obtained immediate popularity, and caused great controversy over the fearless treatment of the theme. The children of the world are represented by a young doctor of philosophy, a strong, well-balanced character; his younger brother, an almost Christlike idealist; and their circle of friends and fellow-students, who, in spite of mistakes and eccentricities, bear the stamp of true nobility of soul.

Children's Crusade, The, a singular movement in 1212, preached in France by Stephen, a peasant boy, and in Germany the same year by Nicholas, also a peasant boy. Some 90,000 children left their mothers and schoolmasters in the spring "to rescue the Holy Land from the

infidels," and ships were placed at their disposal. The French contingent embarked at Marseilles in August; part perished the same month by shipwreck on the island of San Pietro, and the rest were sold into slavery to Mohammedans. The German contingent reached Genoa in August, and was utterly dispersed by various disasters before the next spring. See CRUSADES.

Childs, George William, American philanthropist and publisher: b. Baltimore, Md., 22 May 1829; d. Philadelphia 3 Feb. 1894. He published the Philadelphia 'Public Ledger,' 1864-94. He gave a Shakespeare memorial fountain to Stratford-on-Avon, a memorial window in Westminster Abbey to Cowper and Herbert, and assisted in establishing a home for printers at Colorado Springs. He published 'Recollections of Gen. Grant' (1885); and 'Personal Recollections' (1889).

Chile, *chil'ē*, or **Chili**, *chil'i* (the Republic of), situated on the western coast of South America, between the Andes Mountains and the Pacific Ocean, is bounded on the east by Argentina and Bolivia, and on the north by Peru. In length it surpasses even the Argentine Republic, for it extends from lat. 55° 59' S. to 17° 57' S., a distance of 2,629 miles, but its average width is only 101 miles. The total area is, therefore, about 265,529 square miles. Besides the Andean range on the east, there is a parallel western coast range, and in the valley between the two ranges, from Santiago, the capital, to the south, are found the best agricultural districts and many of the important towns.

Population.—Compared with the other South American countries, Chile ranks as the seventh in size, the fifth in density of population, and the fourth in the number of its inhabitants. The population of the republic in 1895 was 2,712,145, of which number 1,240,353 resided in cities and towns, and 1,471,792 in the rural districts. There has been a considerable increase during the last few years, and on 1 Jan. 1900, the total population was estimated at 3,110,088. The number of the inhabitants of the principal cities on the date last mentioned was, according to an official publication, as follows: Santiago, 291,725; Valparaiso, 135,674; Concepción, 49,766; Iquique, 42,440; Talca, 40,987; Chillan, 34,994; Antofagasta, 19,482; La Serena, 17,137; Talcahuano, 15,643; Curicó, 14,577; San Felipe, 12,359; Valdivia, 9,819; Copiapó, 9,586.

Climate and Productions.—The northern part of Chile is a hot desert; the southern part, a cold region of almost incessant rains; but between these extremes lies a great extent of territory blest with a temperate and healthful climate. Dividing the republic, for convenience of characterization, into five zones, we may say that in the northernmost zone there is a nearly absolute lack of vegetation, but yet we find here some of the chief sources of the national wealth—the deposits of nitrate of soda, mines, etc. The second zone, continuing toward the south, is less torrid. Rain falls several times in the year; and though mining is the chief industry, small areas are also devoted to agriculture. The third zone, in the centre of the country, has a temperate climate and fairly abundant rains. Cattle-raising, mining, and the cultivation of cereals, vines, and fruits are the leading industries. In the fourth zone, where

CHILE

rains are more abundant and the climate cooler, the chief products are wheat, cattle, lumber, etc. The fifth and most southerly zone, extending to Cape Horn, is a land of bold and rugged features with a cold and rainy climate—a land of shepherds, lumbermen, and fishermen.

National Finances.—The national debt of Chile on 31 Dec. 1901, as shown in the report of the auditor-general of the republic, amounted to 302,672,280.91 pesos (Chilean peso = \$0.365). Of this amount, 227,234,400 pesos were for foreign loans dating from the years between, and including, 1885 and 1894. A reduction of 2,896,607.26 pesos in the national debt was effected in 1901. The message of President Riesco (1 June 1902), shows that the revenue, ordinary and extraordinary, in 1901 amounted to 110,059,496.97 pesos. On 31 Dec. 1900 there remained a surplus of 18,576,829.43 pesos. These two sums make a total of 128,913,989.40 pesos. The total of expenditures in 1901 was 130,913,989.94 pesos. There was consequently a deficit of 2,277,663.54 pesos, which sum was increased by certain payments to 2,809,337.66 pesos. In 1902 the president anticipated a deficit of 29,719,339.31, "which may be reduced by 3,000,000 by certain economies, and almost totally met by the 20,000,000 in gold taken from the conversion fund and the premium paid upon this sum. The conversion fund will be made up again out of the sales of land in Magellan territory and of nitrate grounds." The estimated revenue for 1903 amounts to 107,000,000 pesos, and the estimated expenditure to 105,665,545.79 pesos. This somewhat unsatisfactory condition of the national finances may be traced to political events which will be mentioned under *History*. The foreign trade in 1901 amounted to 300,383,118 gold pesos, which was the largest sum on record. Imports were 139,300,766 gold pesos; exports, 171,844,976 gold pesos, an increase of 10,223,079 gold pesos over 1900. Receipts of the custom-house amounted to 71,998,955 gold pesos, of which sum 27,872,696 gold pesos corresponded to imports and 44,126,259 gold pesos to exports.

Countries Leading in Trade with Chile.—The year 1901 cannot be regarded as normal in the matter of imports, the failure of the Chilean wheat harvest having occasioned an unusually large importation of wheat and flour in that year. Analyzing the figures for a normal year, 1899, we find that the five principal nations having commerce with Chile are:

COUNTRIES	Exports to in pesos	Imports from in pesos
Great Britain.....	110,528,378	44,338,050
Germany	20,921,999	29,748,898
France	9,334,281	5,525,162
United States	7,349,858	8,197,569
Peru	4,248,312	5,185,194

Of the Chilean products, which constituted the commerce of exportation, 84 $\frac{1}{3}$ per cent belonged to mining; 10 $\frac{1}{2}$ per cent to agriculture; 2 $\frac{1}{2}$ per cent to manufactures; and the rest to various products and to coin. The imports of that year were classified as follows: Woolen goods, 29,058,119; raw material, 21,731,717; food-products, 17,696,659; manufactures, 14,032,630; machinery, 12,695,066; beverages and cigars, 1,268,099; sundry articles, 9,778,068.

Exports.—One of the principal exports is nitrate, the quantity and value of which has steadily increased during recent years. Chile, in fact, leads the world in the production of

nitrate of soda, no other country being able to supply this mineral in commercial quantities. The value of the exported nitrate in 1899 was 96,650,282 pesos; in 1900, 109,945,156 pesos; in 1901, 118,860,131 pesos; and in 1902 there was a still more noticeable increase in the amount produced. Copper bullion is also exported in considerable quantities, the amount in 1901 being 24,479,922 kilos, valued at 19,627,114 pesos. A decrease is noted during recent years in the exportation of wheat, flour, and barley. In 1898 wheat to the value of 7,696,460 pesos was exported; in 1899, flour to the value of 996,979 pesos, and barley to the value of 2,246,866 pesos. Chile exported in 1901, honey valued at 1,034,088 pesos, and beeswax valued at 582,045 pesos; hay to the value of 260,815 pesos; wine, 68,344 pesos; and gold and silver coin, 13,150 pesos.

Mining.—Chile is the second largest silver mining country in South America, and the third largest copper producer in the world. In the northern zone, notably in the province of Antofagasta, extensive deposits of calcium borate are being worked. The annual exports from the manganese mines in Coquimbo and Atacama are between 20,000 and 25,000 tons. Other minerals, with amounts produced in the year 1900, are: Coal, 896,000 tons; iodine, 318 tons; and gold, 4,576 pounds. The nitrate of soda produced in that year weighed 1,465,935 tons.

History.—The dominion of the Incas of Peru included the northern and central portions of Chile—at least to lat. 37° S. In 1535 the Spanish conquerors of the Inca empire sent their first expedition southward along the Pacific coast; but the task of adding this territory to the Spanish possessions in Peru and Upper Peru (Bolivia) was not undertaken in earnest until 1541, nor was it brought to a successful conclusion before 1550. The courageous Araucanians offered a stubborn resistance to Valdivia's forces, and even as late as the 18th century they made good their prior claim to a large part of the country below lat. 37° S.

Independence and Adoption of Constitution.—In September 1810 was formed the first national government, to rule the country during the captivity of the king of Spain, whom the French held as a prisoner. From that time forward the design to achieve independence was never relinquished, though the events of the years immediately following were of a character to discourage patriotic aspirations. The Chileans were defeated and compelled to return to a nominal subjection; the final success was won with the help of Argentine troops under Gen. San Martin (see ARGENTINA), and the independence of the country was proclaimed in 1818. A constitution, adopted in 1824, and remodeled in 1828, was given its final shaping—substantially the form which it still retains, though modifications demanded by the progress of the country have been made—in 1833. (See under *Government*.) Independence was recognized by a formal arrangement with Spain, and embodied in the treaty of 1844. In 1865, however, a war broke out between the mother country and Chile and Peru, hostilities continuing until 1869. After an interval of peace, the important "war on the Pacific" began.

The War on the Pacific.—For many years the rights of Bolivia and Chile, respectively, in certain mining lands bordering on the Pacific Ocean remained without definition, but in 1874

CHILE

an agreement was entered into between the two countries which apparently disposed of the questions at issue. The exploitation of these lands by Chileans increasing, Bolivia saw fit to reopen the dispute by imposing an export tax on the nitrate, or "saltpetre," obtained in Bolivian territory. A Chilean company refused to pay the tax, alleging that it contravened the treaty of 1874. The Bolivian government's reply was an order for the sale by auction of the property of the offending company, on 13 Feb. 1879. Thereupon the Chilean government sent a man-of-war to seize the port of Antofagasta. It soon became apparent that Chile would be obliged to deal with Peru also in this matter; and in fact a secret offensive and defensive alliance against Chile had been formed by Bolivia and Peru in 1873. On 5 April 1879 Chile declared war against the latter republic. Tacna and the neighboring port of Arica were occupied by the presidents of Peru and Bolivia with their troops; the defense of Iquique was entrusted to a sufficient force, and at Lima a reserve of about 10,000 men was held in readiness to meet the Chileans at any point that might be attacked. The plans of the allies seemed to be well laid, and some initial successes fell to their share.

Capture of the Huáscar.—Two Chilean warships, the *Esmeralda* and the *Covadonga*, blockading Iquique, were attacked by the Peruvian frigate *Independencia* and the monitor *Huáscar*. The *Esmeralda* was sunk by the *Huáscar*, but the latter vessel on 18 October fell in with the *Cochrane* and *Blanco* of the Chilean navy north of Point Mejillones. A fight of great severity ensued. Only 86 men were left alive on board the *Huáscar*, out of her complement of 216, when she was obliged to surrender. This vessel was repaired and added to the Chilean navy.

Triumph of Chile.—Pisagua was captured from the Bolivians by Chilean warships. On 18 Nov. 1879, the allies were defeated in the battle of San Francisco, but before the close of the same month they scored a dearly bought success against the Chilean forces in the battle of Tarapacá. Chilean divisions commanded by Gen. Baquedano invested the town of Moquegua, and on 23 March 1880 entered Torata. Two months later a decisive contest occurred, the city of Tacna (now the capital of the Chilean province of that name) being taken on 26 May. The troops of the allies, including 5,120 Peruvians and 3,200 Bolivians, commanded by Admiral Montero, and the Bolivian president, Gen. Campero, sustained a crushing defeat. Arica, the port of this district, was attacked by the land and sea forces of Chile in June, and fell after making a desperate resistance. In order to emphasize the defeat and to cripple the more important members of the alliance, the Peruvian coast was laid waste, Mollendo was destroyed, Callao and other ports blockaded, and an expedition under Baguedano's command made ready to proceed to Lima. See PERU.

Acquisition of Territory.—As the fruits of her victory, Chile took from Bolivia the districts of Cobija and Atacamá; from Peru the coast line north of the Bolivian possessions to, and including, conditionally, the province of Tacna. Thus Chile's territory on the Pacific was extended northward from the old boundary, at lat. 24° S. One of the allies was cut off from communication with the outside world by way

of the Pacific Ocean; and a strategic frontier was established against the other ally. A truce, instead of a treaty, was concluded between Bolivia and Chile after the war, the sentiment of the Bolivians being utterly averse to any permanent arrangement which did not give them access to the sea. Renewal of negotiations for a definitive treaty, which should include the concession of a seaport, has been repeatedly urged by Bolivia, but hitherto without effect.

Treaty of Ancon.—Peru, by the terms of the treaty of Ancon (1883), surrendered to Chile absolutely the valuable nitrate district of Tarapacá, but with respect to the Tacna-Arica region a peculiar convention was made. It was agreed that Tacna-Arica should be governed by Chile for a period of 10 years, and that at the end of the decade the vote of the inhabitants should decide whether it would be better for the province to revert to Peru or to be administered by Chile in the future—the country thus rejected by popular vote receiving from the other country \$10,000,000 silver by way of compensation. Nearly 20 years have passed, and the Peruvian government has repeatedly urged fulfilment of the treaty, but the plebiscite has not yet been held.

Balmaceda.—Some of the amendments to the constitution which we have referred to above were adopted before the outbreak of the war with Peru and Bolivia; they embodied the liberal ideas which, in 1874, triumphed over the conservatism of the proprietors of large estates—a class practically dominating the government's policy up to that time. The most forceful of the liberal leaders who effected this important political change was Balmaceda, a member of Congress in 1868, minister to the Argentine Republic at the time of the war with Bolivia and Peru, and, in 1885, elected to the presidency of the republic. The conspicuous success of President Balmaceda in his advocacy of measures relating to internal improvements, a system of popular education, the separation of Church and state, etc., created bitter antagonisms. United in opposition to him were all those who disapproved of his vigorous liberalism on principle, and all who were jealous of his power as an individual. In 1888 his cabinet was overthrown; his unyielding attitude in this crisis provoked an armed revolt; and the country was plunged into civil war, the operations of the forces of the revolutionists being directed by a junta representing Congress, and the president somewhat too readily assuming the powers of a dictator for the defense of his position. Balmaceda was defeated, and died by his own hand on 19 Dec. 1891.

The effect of this civil war upon Chile's foreign credit was deplorable. With characteristic enterprise her people have developed the resources of the country in many new directions, yet the utmost wisdom and firmness in the administration of her government have been required to bring about even such conditions of the national finances as we have stated. On the other hand, the country was fortunate in escaping a serious foreign war.

The Baltimore Incident.—The opinion prevailed in Chile when this conflict was at its height that the United States government, through Minister Patrick Egan, was showing favor to the cause of Balmaceda, and discriminating against the congressional party.

CHILE

The fierce resentment felt by the latter expressed itself in an attack upon sailors of the United States cruiser *Baltimore*, who became involved, while on shore, in a brawl with Chilean sailors. There was a riot of the populace in the streets, and several of the *Baltimore's* men were seriously or mortally wounded. When a report of this indignity reached Washington, suitable representations were made by the authorities there, but unfortunately it was necessary to address such representations to a merely provisional government at Santiago. The latter not only refused the just demand for satisfaction, but also insisted in offensive terms that the men who had been assaulted should be handed over to Chile for trial as criminals. An improvement in this threatening situation occurred when the management of Chilean affairs was entrusted to President Montt, and when the demand of the United States was emphasized by the sending of two additional warships to Chile. The new president tendered apologies for the discourtesy of the provisional government, as well as for the attack upon men wearing the uniform of the United States; and compensation was made to the wounded sailors, or to the families of those who had died.

Arbitration and Limitation of Naval Armaments.—On 28 May 1902, the plenipotentiaries of Chile and the Argentine Republic concluded two important agreements, the first of which provides for the arbitration of all questions not affecting constitutional precepts, or that cannot be settled by direct negotiations. It is entitled a "General Treaty of Arbitration," and the desire is expressed in its introductory clause "to settle by friendly methods whatever questions may arise between the two countries." The second agreement is entitled a "Convention on Naval Armaments," which has "the object of removing all causes of anxiety and suspicion." The two governments "renounce the acquisition of the war vessels they have in construction and the making for the present of any new acquisitions"; agreeing, moreover, to reduce their respective fleets until they arrive at "a prudent equilibrium." In this connection we note that the launching of the first iron steamer built in Chile took place on 24 Nov. 1901 at Valparaiso. The entire ship, from keel to truck, was of domestic construction.

Government.—The national Congress is composed of two chambers: (1) The chamber of senators, with 32 members, elected for a term of six years by direct vote and by provinces, in the proportion of one senator to each three deputies; (2) the chamber of deputies, with 94 members, elected for a term of three years. Congress exerts a certain amount of control over the president of the republic by giving or refusing its confidence to the cabinet ministers appointed by him—as illustrated in the contest with Balmaceda. To represent Congress in the period of its recess, there is a Permanent Committee of 14 members, one-half chosen by each chamber.

The president of the republic holds office for five years, and he cannot be re-elected for the next consecutive period. A council of state, composed of 11 members, some of whom are appointed by the president, and others by the chambers, has the power to intervene in certain appointments, and its consent is necessary for the promulgation of the laws, the granting of

pardons, and some other matters. This council is not to be confused with the cabinet, in which are but six ministers or secretaries, to wit: The minister of the interior; of foreign affairs; Church, and colonization; of justice and public instruction; of war and the navy; of the treasury; of industries and public works.

The judicial branch of the government comprises: The supreme court of justice, located at Santiago, and composed of seven members, with authority over all other tribunals of the republic; the court of appeals, for the great districts of Tacna, Serena, Valparaiso, Santiago, Talca, and Concepción; one or more justices of the peace in each department of the republic; and sub-delegation or minor district judges. Juries exist only for suits involving the question of abuse of the freedom of the press.

For the purposes of political government, Chile is divided into 23 provinces and one territory. The provinces are divided into departments, the departments into sub-delegations, and the latter into districts. For the purposes of local administration, the republic is divided into municipal circumscriptions, or communes, one for each 20,000 inhabitants. A list of the provinces follows, beginning at the north: Tacna, Tarapacá, Antofagasta, Atacama, Coquimbo, Aconcagua, Valparaiso, Santiago, O'Higgins, Colchagua, Curicó, Talca, Linares, Maule, Nuble, Concepción, Bio-bio, Arauco, Malleco, Cautin, Valdivia, Llanquihue, and Chiloé. The territory referred to above is Magallanes, at the southern end of the continent.

Education.—In 1901 there were 1,700 public schools, with 124,265 names of scholars on the books, and an average attendance of 79,666. During the first six months of 1902, there were opened 88 new schools and three new lyceums. The University of Chile in its various departments (including law, engineering, medicine, theology, and the fine arts) has an attendance of 1,300. Other public educational institutions are: The National Institute, with 1,200 pupils; Institute of Pedagogy; about 30 lyceums of secondary instruction for men; and 15 lyceums for girls; 6 normal schools; a Conservatory of Music; a Commercial Institute; also schools of fine arts, agriculture, arts and trades, mining, for the blind and for deaf-mutes, professional schools for girls, and industrial schools. Private educational establishments are numerous and receive pupils from other Latin American countries. The Roman Catholic University has courses of engineering and law. There are several museums of natural history and fine arts; an Astronomical Observatory, and meteorological observatories; botanical gardens, and, in various parts of the country, 41 public libraries, with 240,000 volumes.

Army and Navy.—By the law of 31 Dec. 1896 the maximum strength of the active army was placed at 9,000 men, and in 1899 the effective strength of the active army was stated to be 6,987 men; nevertheless a system of military instruction and drill is enforced which practically renders a much larger number available for military service in an emergency—possibly 10 regiments of infantry, 6 of artillery, 8 of cavalry, and one of military engineers. Establishments for military instruction are the Academy of War, the Military School, and the School for Sergeants and Corporals. The Chilean navy includes nearly 40 vessels of various classes:

CHILE SALTPETRE — CHILIASM

the armor-clad *Capitan Prat*, O'Higgins, and *Almirante Cochrane*; the monitor *Huáscar*; five protected or armored cruisers; five gunboats and torpedo-cruisers; four destroyers; 13 torpedo-boats; a training ship, etc. Naval instruction is given on board the vessel last mentioned, as well as in the academy at Valparaiso.

Railways, Postal Service, etc.—The state railways in operation in 1901 had an extent of 1,420 miles, and private railways 1,430 miles. Including several hundred miles which have been constructed since that time, we may say that there are somewhat more than 3,000 miles of railway in the republic; and the interesting statement is made that, although the government lines transported nearly 6,500,000 passengers and 2,500,000 tons of freight in 1899, "the net product was small, because rates are kept very low, for the purpose of promoting the public wealth by facilitating intercourse and the interchange of products." All the more important cities have street railways.

There are about 740 post-offices, and the total delivery in 1899 was 40,000,000 pieces. Newspapers, reviews, and other periodical publications are circulated free of postal charges, in the interest of the public education. The telegraph service is chiefly performed by the state, the private lines being only about 2,800 miles in extent, out of a total of 14,000 miles. Two lines of underground cables cross the Andes, and there are two submarine cables. Telephone companies have about 15,000 miles of wires in operation in the larger towns.

Agriculture, and Various Industries.—There are approximately 6,200,000 acres under cultivation, while the total area of arable land is probably not less than 25,000,000 acres. The production of wheat in good seasons is about 22,700,000 bushels, and of barley about 4,250,000 bushels. Other grains, fruits, and vegetables are raised in large quantities in the central provinces. The cultivation of the vine has received much attention during a score of years; in fact, this industry ranks next to cattle-raising in certain districts. Even the island of Juan Fernandez (made famous by Defoe's story of 'Robinson Crusoe') is included in the plans for industrial development. This island, lying 600 miles west of Valparaiso, belongs to Chile, and arrangements are being made quite seriously for turning to some good account the interesting little possession.

Milling holds the first position among Chile's manufacturing industries. More than 500 flour mills, supplied with the most modern machinery, are in operation in different parts of the country, especially the provinces lying south of the capital. Wood-working and tanning, and the manufacture of woolen cloth, building materials, and coarse paper are also worthy of mention.

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MARRION WILCOX,
Authority on Latin-America.

Chile Saltpetre. See NITRATE OF SODA.

Chi-Li, or Chih-Li, China, one of the 18 provinces into which the country proper is divided. It has an area of 58,949 square miles and is bounded north by Mongolia, east by the gulf called Pe-Chi-Li, and by the province of Shang-Tung, and west by the province of Shan-Hsi. Chi-Li is in many respects the most important of the Chinese provinces, containing as it does the imperial capital, Peking, the treaty port of Tien-Tsin, and the only completed line of railway in the empire. The Great Wall runs across the whole of the northern part of Chi-Li, while on the coast are the forts of Taku, and the nearest approach to a naval station belonging to the Chinese government. The province is mountainous and traversed by important rivers, notably the Pei-Ho, the Lan, the Ho-Kien, and the Hu-to. The Yu-Ho is especially important because of the canal system developed throughout its course in Chi-Li. The provincial administration is in charge of a viceroy (Tsoung-tou) and a Fou-youen or sub-governor. There are numerous towns of the first, or Fu, class, second, or Chou, class, and third, or Hien, class. These towns are surrounded by walls. There are Christian missionaries of many denominations throughout the province. In 1900 the population was estimated at 25,000,000, including a large Manchu element. They are generally engaged in commerce, Chi-Li having much communication with Russia by way of Siberia. The climate is at times severe, the Pei-Ho being generally frozen over from December to March.

Chiliasm, kil'ī-āzm, the belief that Christ will come to earth and rule the world from Jerusalem for 1,000 years. The Latin word millennium means the same thing. The Revelation of John is the chief authority of the Chiliasts. Papias, Justin Martyr, Irenæus, Tertullian, and Lactantius were Chiliasts, but Origen was opposed to the notion. Papias, bishop of Hierapolis, says, in the millennium every vine will bear 10,000 branches, every branch 10,000 shoots, every shoot 10,000 sprigs, every sprig 10,000 bunches, every bunch 10,000 berries, and every berry 36 times 25 gallons of wine; and if a saint comes to pluck a berry it will cry out, "Pluck me, O saint; I am better for being plucked, praise the Lord." The Fifth Monarchy Men were, of course, Chiliasts, only they maintained that the golden age had begun, and that they were of it.

CHILKAT — CHILLINGHAM WHITE CATTLE

Chilkat (chĭl'kăt) **Inlet**, the western arm of Lynn Canal, an inlet in Alaska, in about lat. 50° 7' N.

Chilkat, or **Dalton, Pass**, a route in Alaska traversed by miners in reaching the gold fields of the Klondike. It is an overland trail, which was used for many years by J. Dalton, a trader, as a pack train route and for driving in cattle. It follows a direct course, more or less independent of waterways, from Chilkat Inlet to Fort Selkirk, and is said to be less difficult than the road over Chilkoot Pass.

Chilkoot (chĭl'koot) **Inlet**, the eastern arm of Lynn Canal, an inlet in Alaska. It is again subdivided, its principal arm being called Taig, an inlet which stretches for 15 miles north and south in about long. 135° 20' W.

Chilkoot Pass, a pass over the mountains in the northern part of Alaska, traversed by thousands of gold-seekers in the Klondike gold fields' excitement in 1897-8. By way of the Chilkoot Pass is the most direct route to Dawson City, the principal starting point to the Klondike region. The trail starts from Dyea, along the river of that name, and crosses the Pass at an elevation of 3,500 feet, to the head of Lake Lindeman, a total distance of 28½ miles. From the latter place to Dawson City is 548 miles. The Chilkoot Pass route is the old trail used for generations by the Indians, and for many years was the only one taken by miners and prospectors to reach the interior. It is by far the shortest route to the Yukon. The difficulties and dangers attending this route are many, and the steepness and roughness of the ascent have proved fatal in numerous instances, to those unaccustomed to endure hardships. The summit of the Pass is 13 miles from Dyea, the first six miles being traversed by a good wagon road. Owing to the winding of the Dyea River that stream must be crossed several times by ford or ferry. The trail then enters a narrow cañon with steep, rocky sides, which it follows to Sheep Camp, four and a half miles farther on, which point is the timber line. From Sheep Camp to the summit the rise is from 1,800 feet in three and a half miles, to 1,000 feet in half a mile, and here masses of broken rock make the ascent, which is in some places almost perpendicular, difficult and hazardous. It is at this point that the aerial tramway is built.

Chillan, chĕl-yän', Chile, capital of the province Ñuble, about 75 miles northeast of Concepcion. It consists of an ancient and a modern portion, the former built by the Spanish conquerors, who made it a place of some strength, in which the early settlers often found an asylum when hard pressed by the Araucanians. The old town was founded in 1579, and destroyed by an earthquake in 1835. The new town was built shortly after the latter date. Pop. 29,000.

Chilled Iron, iron cast in metal molds called chills, where, on account of the rapid conducting of the heat, the iron cools more quickly on the surface than it would do if cast in sand. Chilled iron is whiter and has a harder surface than iron cast in any other way. It is used in making axle-boxes, hubs, plowshares, and some hammers and anvils.

Chillianwalla, chĭ-lĭ-an-wāl'a, a village of the Punjab, about five miles from the left bank

of the Jhelum, 85 miles northwest of Lahore, famous for a well-contested battle fought in its vicinity, in 1849, between the British under Lord Gough and the Sikhs, in which the former, though they remained masters of the field, lost 2,269 men. A second battle fought about six weeks after, at Gujerat, nearly annihilated the Sikh force.

Chillianwalla, Battle of, an engagement in India between the Sikh forces in considerable strength, and the British commanded by Lord (afterward Viscount) Gough, fought 13 Jan. 1849. The Sikhs were completely routed, but the loss of the British was very severe: 26 officers were killed and 66 wounded, and 731 rank and file killed, and 1,446 wounded. The Sikh loss was 3,000 killed and 4,000 wounded. On 21 February, Lord Gough attacked the Sikh army, under Shere Singh, in its position at Goojerat, with complete success; and the whole of the enemy's camp fell into the hands of the British.

Chillicothe, chĭl-lĭ-kōth'ě, Mo., a city and county-seat of Livingston County; on the Wabash, the Chicago, Milwaukee & St. P., and the Hannibal and St. J. R.R.'s, 70 miles east of St. Joseph. It is a farming trade centre and has several manufacturing industries. It is the seat of the Chillicothe Normal School, State Hospital, State Industrial School for Girls, and St. Mary's Hospital, and is near the noted health resort, Laurel Mineral Springs. It has several daily and weekly newspapers, electric lights and street railroads, and two national banks. Pop. (1900) 6,905.

Chillicothe, Ohio, city and county-seat of Ross County, on the Scioto River, Paint Creek, the Norfolk & W., the Cincinnati, H. & D., and the Baltimore & O. R.R.'s, and the Ohio & Erie Canal, 50 miles south of Columbus. It is an agricultural and coal-mining region, and has flour mills, foundries and machine shops, daily and weekly newspapers, three national banks, and an assessed property valuation of \$6,000,000. Chillicothe was the first capital of the State. Ohio celebrated in May 1903, her 100th birthday as a State, and it was peculiarly fitting that Chillicothe should have been chosen as the place for the celebration, for all the historic memories of the early years of the State's existence cluster about this city. It was here that Gen. Arthur St. Clair set up his Territorial government, as governor of the Northwest Territory; it was here that the agitation for Statehood gathered momentum, led by a quartet of Chillicothe men—Thomas Worthington, Nathaniel Massie, Edward Tiffin, and Duncan McArthur. It was here, on 29 Nov. 1802, that a constitution for the State was adopted, in compliance with the requirements of the Federal Constitution; and, finally, it was here, in the spring of the succeeding year, that the young State was ushered into being and Edward Tiffin elected her first governor. Pop. (1900) 12,970.

Chil'lies, the fruits of the Capsicum, used to make cayenne pepper, pickles, and chilli vinegar. See CAYENNE PEPPER.

Chil'lingham White Cattle. See WHITE CATTLE.

CHILLINGWORTH — CHILTON

Chil'ingworth, William, English Anglican divine and controversialist: b. Oxford October 1602; d. Chichester, Sussex, 30 Jan. 1644. He was matriculated in Trinity College, Oxford, in 1618, and in 1628 was made a Fellow of the same college. Having been won to the Roman Catholic Church through the arguments of the Jesuit Father Fisher, Chillingworth entered the English College at Douai, where Laud, then bishop of London, by correspondence implanted in his mind doubts regarding the foundation of the Roman Catholic system; and, resolved to make a thorough investigation, Chillingworth returned to England after a few months abroad. The result was that he declared for Protestantism and in 1634 set forth, in a treatise that was not published and is now lost, the grounds of his conclusion. Laud procured his nomination to a church benefice in 1635, but Chillingworth's scruples about subscription to the 39 articles and acceptance of the Athanasian creed was an obstacle that could not then be overcome. In 1637 was published his great work, 'The Religion of Protestants: a Safe Way to Salvation.' In the preface he explained away his former scruple about the 39 articles, and the next year was named chancellor of Sarum with a prebendaryship annexed. When Gibbon in his autobiography explains his own religious experiences, which closely resemble those of Chillingworth, he insinuates that the reconverted convert afterward repudiated privately the cardinal doctrines of the Church of England.

Chillon, shē-yōn or shīl'ōn, a castle, Switzerland, on the Lake of Geneva, 6½ miles southeast of Vevay, once an important stronghold of the counts and dukes of Savoy, and the prison-house of Francis Bonivard, prior of St. Victor, Geneva, from 1530 to 1536. It stands on a rock rising 22 yards from the shore of the lake, and is reached by a bridge. It probably dates from the 9th century. Bonivard was confined in it by the Duke of Savoy because he had assisted the republic of Geneva, with which the Duke was at enmity. Byron's poem, 'The Prisoner of Chillon,' founded on this incident, has made it well known.

Chilo, kī'lō, one of the seven wise men of Greece. See CHILON.

Chiloe, chē-lō-ā', Chile, province of, consists of the island of that name on the west coast, which is separated from the mainland by a narrow strait on the north and by a gulf 30 miles wide on the east, and has a length of 115 miles, and an extreme breadth of 43 miles, and of a number of neighboring islets, mostly uninhabited; total area, 3,995 square miles; almost all Indians living on the principal island. Chiloe proper is hilly in the interior, and everywhere covered, except immediately along the shores, with nearly impassable forest. The climate is mild and not unhealthy, although inordinately wet. The Indians belong to a subdivision of the Araucanian family; they are a gentle and honest race, mostly engaged in fishing and in lumbering, timber being at present the chief export from the island, though immense deposits of coal have been reported. Oysters, which are very

scarce elsewhere in South America, are found in large quantities in the Chiloe Archipelago. The potato here, as in other parts of South America, grows wild. The Spaniards discovered the archipelago as early as 1558. The capital and chief seaport, Ancud, on the north coast, has a good harbor, is the seat of a bishop, and has a population of (1895) 3,182. Pop. of province 82,362.

Chilon, kī'lōn, one of the so-called seven wise men of Greece. He flourished about the beginning of the sixth century B.C., and was a native of Sparta, and one of the Ephori, a body of magistrates which he is even said to have originally introduced. A collection of his sayings may be seen in Orelli's 'Opuscula Græcorum sententiosa' (1819).

Chilopoda, kī-lōp'ō-dā, a group of myriapods represented by the centipede (q.v.). In these animals the body is composed of from a few to between 100 and 200 segments; the body is flattened, and there is but a single pair of legs to each segment. There are three pairs of mouth-appendages,—that is, a pair of jaws succeeded by two pairs of accessory jaws; while the first pair of legs are modified to form the poison fangs, which contain at their base a poison sac, the ducts from which open by a minute pore, out of which the blood oozes when the creature bites. The *Chilopoda* are divided into four families,—*Lithobiidæ*, *Scolopendridæ*, *Geophilidæ*, and *Scutigeraidæ*.

Chilperic, chīl'pě-rīc, two Merovingian kings: 1. CHILPERIC I., king of Soissons: d. 584. He never was acknowledged king of all the Frankish land, but divided the kingdom with his three half-brothers; he had, however, great power throughout their dominions by reason of his influence with the nobles. The murder of his wife, Galswintha, involved him in a war with her brother-in-law, Siegbert of Austrasia. 2. CHILPERIC II., king of Neustria: d. 729. He was several times at war with Charles Martel (q.v.), but was forced to submit to him, and was in 719 made king of the Franks.

Chil'tern Hills, a range of flint and chalk hills in England, extending through Oxford, Hertford, and Buckingham shires; loftiest summit, 905 feet. These hills were anciently covered with forests, and were infested by numerous bands of robbers. The steward of the Chiltern Hundreds is an officer of the Crown, appointed to protect the people of Bucks from the robbers of the Chiltern Hills. This office is now a sinecure, but as a member of Parliament can only resign his seat by accepting office, he accepts this sinecure, which he immediately vacates for the benefit of others. The stewardship of the manors of East Hundred, Northshead, and Hempholme, are other sinecure offices made use of for the same purpose.

Chiltern Hundreds. See CHILTERN HILLS.

Chil'ton, Robert Hall, American soldier: b. London County, Va., 1817; d. Columbus, Ga., 18 Feb. 1879. He graduated at West Point 1837; became captain of the First Dragoons 6 Oct. 1846, and was brevetted major for gallant and meritorious conduct at Buena Vista, Mexico, 23 Feb. 1847. In this battle Jefferson Davis, afterward president of the Southern Confederacy, but then colonel of the First Mississippi

CHIMÆRA — CHIMNEY

Rifles, was severely wounded, and Chilton bore him from the field, a life-long friendship resulting from the event. He became a brigadier-general in the Confederate service 20 Oct. 1862, was chief of staff to Gen. Lee, and inspector-general of the Army of Northern Virginia. After the war he was engaged in business in Columbus, Ga.

Chimæra, kī-mē'ra, in classic mythology, a monster, breathing flames, with the head of a lion, the body of a goat, and the tail of a dragon, which laid waste the fields of Lycia, and was at last destroyed by Bellerophon, with the help of Pegasus. Her form is described by the poets as an unnatural mixture of the most incongruous parts. Therefore the name of chimæra is used for a nondescript, an unnatural production of fancy. According to some Chimæra was a volcano in Lycia, around the top of which dwelt lions, around the middle goats, and at the foot poisonous serpents. Bellerophon is said to have been the first who rendered this mountain habitable.

Chimæroidea, one of the primary divisions of fishes, the equivalent of *Holocephali* (q.v.).

Chimango, shē-män'gō, a carrion hawk of South America (*Ibycter chimango*), closely related to the Caracara (q.v.) The plumage is black, with whitish streaks on neck and breast in the adult, which are lacking in the young. These birds are particularly numerous in the Falkland Islands. Darwin describes them as without fear of man, frequenting inhabited regions and feeding on all kinds of refuse.

Chimborazo, chēm-bō-rä'sō or chīm-bō-rä'zō, Ecuador, a peak of the Andes, in the province of Quito. Though not the loftiest summit of the Andes, it rises 20,700 feet above the sea-level, and its top is covered with perpetual snow. Through the transparent air it presents a magnificent spectacle from the shores of the Pacific. This mountain was ascended in 1802 by Humboldt and Bonpland, who, though they failed to reach the summit, yet mounted to the great height of 19,390 feet, a greater elevation than ever was before attained by man. Their further ascent was prevented by a chasm 500 feet wide. The air was intensely cold and piercing, and owing to its extreme rarity blood oozed from their lips, eyes, and gums, and respiration was difficult. In 1880 the summit was reached for the first time by Mr. E. Whymper.

Chimere, shì-mēr', the upper robe to which the lawn sleeves of a bishop are attached. In the Roman Catholic Church it is of purple silk, and of black satin in the Church of England.

Chimes, music mechanically produced by the strokes of hammers against a series of bells, tuned agreeably to a given musical scale. The hammers are lifted by levers acted upon by metallic pins, or wooden pegs, stuck into a large barrel, which is made to revolve by clock-work, and is so connected with the striking part of the clock mechanism that it is set in motion by it at certain intervals of time, usually every hour, or every quarter of an hour. The music thus produced may consist of a direct succession of the notes constituting an octave, frequently repeated, or it may be a psalm tune or short pop-

ular air in the key to which the bells are tuned. This species of mechanical music most probably had its origin, like clock-work itself, in some of the monastic institutions of Germany, in the Middle Ages. The first apparatus for producing it is said to have been made at Alost, in the Netherlands, in 1487. The chime mechanism may be adapted to act with the large bells of a church steeple, by means of wheel-work strong enough to raise heavy hammers; or a set of bells, of different diameters, may be arranged concentrically, within one another on one common axis, sufficiently small to be introduced into the frame of a clock, or even of a watch. The chime mechanism is sometimes so constructed that it may be played like a piano, but with the fist instead of the fingers. This is covered with leather, that the blow on the key may be applied more forcibly. Difficult as the performance is, some players can execute compositions consisting of three parts, and even produce trills and arpeggios. Burney relates that the chime-player Scheppen, at Louvain, laid a wager with an able performer on the violin that he would execute a difficult solo for the violin with the bells, and won his wager. Pott-hoff, organist and chime-player at Amsterdam, played his bells with the facility of a performer on the pianoforte, although every key in his apparatus required a force equal to a two-pound weight. Burney heard him perform some fugues in 1772. The finest carillons or sets of musical bells are to be found in Belgium, at Bruges, Ghent, Antwerp, Namur, and Mechlin. These consist of from 40 to 50 bells, the largest weighing several tons, the smallest only a few pounds. Instead of bells, sometimes bars, wires, or tubes are used.

Chim'ney, an upright structure of stone, brick, etc., enclosing one or more flues or passages through which smoke and gas from the fire in a stove, furnace, or fireplace may escape into the open air. How far the Greek and Roman architects were acquainted with the construction of chimneys such as we have is a matter of dispute. That kitchens and baths were provided with chimneys appears certain, but how far other apartments were so provided is doubtful. An ancient mosaic found in Algeria, and representing a Roman country mansion, shows chimney stacks projecting above the roof. Of course in southern Europe fires are less necessary than in northern Europe. Chimneys require much attention to make them secure and prevent their smoking, so great an annoyance to domestic comfort. It seems at present to be acknowledged that it is much better to exclude the cold, damp air from the flues, by narrowing the aperture at the top, than to give larger vent to the smoke at the risk of admitting a quantity of air to rush down the flue. For this reason chimney pots are of great use. In Prussia, where the architectural police is strict, great attention is paid to the erection of chimneys, and to the regular sweeping of them, the chimney-sweepers being bound to sweep the chimneys of a certain number of streets within a regular time. The longer a chimney the more perfect is its draft, because the tendency of the smoke to draw upwards is in proportion to the difference of weight between the column of air included in a chimney, and an equal column of external air; and the heated air in the chimney being lighter

CHIMNEY-SWALLOW — CHINA

than the external air, the longer the chimney is the greater is this difference. Short chimneys are liable to smoke, and fireplaces in upper stories are therefore more apt to smoke than those in the lower ones. Two flues in the same chimney should not communicate with each other short of the top. In manufactories tall chimneys are built for the purpose of carrying away the great quantities of smoke, which would otherwise be highly deleterious to the health of those living in the neighborhood. In chemical works, especially, these chimneys are sometimes built to an immense height. Such chimneys are now built from the inside, by which the expense of the scaffolding is saved.

Chimney-swallow, a species of swallow (*Hirundo rustica*) so-called because of its habit of selecting chimneys and similar sites for its nests. The bird covers the whole of Europe and extends into China, and is one of the most common of the bird kingdom throughout the world, for it has relatives in Africa and America, where the chimney-swift is recognized as belonging to the same group. See SWIFTS.

Chimoio, Africa, a town in the Portuguese possessions, near the border of Mashonaland, 118 miles from Beira on the coast. A railway connects it with Fontesvilla, 28 miles northwest of Beira, and is being continued inland to Salisbury.

Chimpanzee, *chīm-păn'zē* or *chīm-păn-zē'*, an anthropoid ape (*Anthropopithecus niger*), native in the equatorial region of Africa. In size it is between the orang and the gorilla, although when seen it exhibits little of its stature, for it rarely stands upright, its habitual attitude being that of a bent creature, supporting itself on its long forearms. As the chimpanzee is arboreal in its habits, its hands and feet are larger, in proportion, than those of other apes, and this enables it to climb to the topmost branches of the great trees for soft fruits and insects, birds' eggs, and similar fare. The appetite for fruits makes the chimpanzee a menace to the plantations, especially when bananas are in edible condition. The natives guard the plantations, and as the animal is timid toward man this usually saves the crop; but when he cannot run away, the chimpanzee at bay is a formidable foe, using his long, sinewy arms and sharp teeth with deadly effect. He is even said to be a match for the leopard.

The habits of chimpanzees are largely nocturnal, and their long-drawn, loud, and terrifying cries may be heard at great distances. In the black recesses of the jungles, these cries would serve as calls to stragglers of the troop, and might also, by their suggestion of large numbers, scare away enemies. The nests whereon the females rest when bringing forth and rearing their young, are platform-like structures, built high in the tree-tops; these are deserted as soon as the young one is able to travel.

Chimpanzees are more nearly human in their action and intelligence than any of the other large apes, and many experiments have been tried in training and teaching them. Indeed, they have been made the subject of careful psychological investigation in various ways. They are playful and amusing, and exhibit none of the facial sombreness and ferocity of the gorilla, which they so closely resemble in structure.

The skin on the face of the chimpanzee is naked, yellowish in color, and surrounded by the long black hair which hangs about the head and shoulders. The body is covered with shorter, but equally shining black hair.

Various records are extant as to the training and habits of famous specimens of this species, kept under observation in various zoological gardens. Consult: Hartmann, 'Anthropoid Apes' and general works on natural history. See APE; GIBBON; GORILLA; ORANG-UTAN.

Chin-fly, a horse bot-fly (*Gastrophilus nasalis*) which has been confused with the horsebot (*G. equi*). This species is smaller than the bot, densely hairy, with the thorax rust-colored. The abdomen is whitish at base and the wings are not spotted. It deposits its white eggs on the hairs about the lips or in the nostrils of equine animals, within easy reach of the tongue, and it is probable that the maggots hatch out more promptly than in the other species. It has been found common and troublesome in Kentucky. Also, in Europe it is a parasite of the ass, mule, and goat. See BOT-FLY; HORSE BOT-FLY.

Chin-Kiang, *chīn-kē-äng'*, or **Chin-Kiang-Foo**, a city of China, in the province of Kiang-Su, on the right bank of the Yang-tse-Kiang, near the junction of the Imperial Canal, 150 miles from Shanghai. In 1861 it was made a treaty port. It is advantageously situated for trade, as the river is navigable for large vessels. Extensive suburbs stretch along the river and the canal. Chin-Kiang forms the key of the empire, as the blockade of the river and canal at this spot would in a great measure prevent all communication between the north and south. The city was formerly fortified, but has been dismantled. In 1842 it was taken by the British after a determined resistance on the part of the Manchu garrison. It was also taken by the Tai-ping in 1853. They defeated the Imperialists here on 1 Jan. 1856, and finally abandoned the city in 1858. Cotton goods form the chief import, and the exports are numerous and valuable. Pop. 200,000.

Chin-Wang, *chīn'wäng'*, a city of China, in the province of Chi-Li. It was declared a treaty port and opened to foreign commerce in 1898. Pop. (1900) estimated 39,000.

China, or **Chinese Empire**, an immense territory, stretching from the centre to the eastern extremities of Asia, and occupying nearly a third of the surface of that continent; between lat. 18° 20' and 56° N., and lon. 73° and 135° E.; bounded north by Siberia; west by Russian Turkestan, the Russian Pamir, Cashmere, etc.; south by India, Burma, Anam, and the China Sea; east by Siberia, Korea, and portions of the North Pacific Ocean (Eastern Sea, and Yellow Sea); greatest length, west to east, about 3,000 miles; greatest breadth, 2,400 miles; area, about 4,300,000 square miles. This vast empire is usually divided into China Proper, which forms its nucleus, and the following Dependencies:

Manchuria (Chinese, *Tung-san-Sheng*) comprises the extreme northeast portion of the Chinese empire. It is bounded on the north by the river Amur and Russian territory, east by the Russian maritime province, west by Mongolia, and south by the Gulf of Liao-Tung and Korea. It is divided into the three provinces

CHINA

Mukden, Hei-lung-Kiang, and Kirin, the respective capitals of which are Mukden, Tsitsihar, and Kirin. The total area is 280,000 square miles. *Mongolia* is the name given to the vast stretch of desert land which, interspersed with infrequent oases, stretches across the greater part of the north of China along the Siberian frontier. A large part of its area of 1,288,000 square miles is taken up by the Gobi desert. The population is almost entirely nomadic. The chief town is Urga. *Eastern or Chinese Turkestan* is a mountainous region lying between the western tract of the Gobi desert and the Pamirs, and enclosed north and south by the ranges of the Tian-Shan and the highlands of Cashmere and Tibet. It possesses an area of 431,000 square miles. The principal towns are Kashgar and Yarkland. *Sungaria or Dzungaria*, the smallest of the tributary states of China, lies to the northwest of Turkestan, on the banks of the Ili River, at the junction of Mongolia, Turkestan, and the Russian province of Semipalatinsk. Its area covers 147,900 square miles, and its population is said to amount to half a million. *Tibet* comprises the mountainous region lying between Turkestan and Nepal and Assam. On the east it adjoins China Proper, and on the west Cashmere. It covers an area of 651,500 square miles. Its capital is Lassa.

The authority exercised by the Chinese over their dependencies is by no means uniform. Some of the dependencies are closely connected with the empire, while others are merely tributary; and Tibet is so independent as to do little more than profess a nominal allegiance to the emperor of China, as the suzerain of the country.

CHINA PROPER (anciently *Cathay*; Chinese, *Chung Kwoh*, "Middle Kingdom") forms the southeastern portion of the empire, and occupies less than a third of its whole extent. Not including the island of Hainan, it lies between lat. 20° 20' and 41° N., and lon. 98° and 123° E. China is bounded, north by one of the most remarkable of human structures, the Great Wall, which proceeds directly over mountain and valley, and for a length of 1,250 miles forms the barrier between China and Mongolia; on the west it is bounded by Tibet; on the south by Burma, Tonkin, and the China Sea; and on the east by the North Pacific Ocean. There are 18 provinces with area and population as follows:

Provinces	Area; English square miles	Population	Population per square mile
Chi-Li (Pe-chi-Li)	115,800	20,937,000	172
Shan-Tung	55,970	38,247,900	683
Shan-Si	81,830	12,200,456	149
Honan	67,940	35,316,800	520
Kiang-Su	38,600	13,980,235	362
Ngan-Hui	54,810	23,670,314	432
Kiang-Si	69,480	26,532,125	382
Che-Kiang	36,670	11,580,692	316
Fu-Kien (Fokien)	46,320	22,876,540	494
Hupei	71,410	35,280,685	492
Hunan	83,380	22,169,673	266
Shen-Si	75,270	8,450,182	111
Kan-Su	125,450	10,385,376	82
Sze-Chuen	218,480	68,724,890	314
Kwang-Tung with Hainan	99,970	31,865,251	319
Kwang-Si	77,200	5,142,330	67
Kwei-Chau	67,160	7,650,282	114
Yünnan	146,680	12,324,574	84
Total	1,532,420	407,253,029	av. 266

Physical Features.—The coast-line, forming an irregular curve of about 2,500 miles, gives about one mile of coast for every 500 miles of area. It is not deeply penetrated by gulfs, the only one of great extent being that of Pe-chi-Li in the northeast, but numerous indentations form safe and capacious roadsteads. With exception of a bold and rocky peninsula in the province of Shan-Tung, the shore from the Gulf of Pe-chi-Li south to the island of Chusan is flat, and in many places so little raised above the sea-level as to be extensively inundated during a continuance of strong winds. From Chusan to the mouth of Canton River it is usually rocky; from this point southwest, flats chiefly prevail. A peninsula of some size juts out in the extreme south from Kwang-Tung province, separated from which by a narrow strait is the large island of Hainan. Chusan Island and archipelago are also of importance, but most of the innumerable islands dotted round the Chinese coast are very small. The large island of Formosa, off the east coast, now belongs to Japan. Many lighthouses have been planted along the coast. Owing to the exclusive policy of the Chinese and their dislike of foreigners, a great part of the interior of the country must be regarded as still almost a *terra incognita*. The surface is mostly mountainous. The general slope is from west to east, and the mountains are a continuation of those of Tibet and Central Asia. Branches of the Kuenlun traverse almost the whole breadth of China. In Western Sze-Chuen, there are peaks reaching the height of 25,000 feet. In the north the Nan-shan branch of the Kuenlun range runs under various names along the northeast of China till it reaches the frontier of Manchuria, north of Peking. A third great mountainous region of China is in the southeast, where extensive chains stretch on the south of the Yangtse-Kiang all the way from the highlands of Yunnan to the eastern seaboard. Between the main mountain systems, and following courses which may be roughly described as parallel, run the two great rivers of China, the Hoang-Ho, and the Yangtse-Kiang. Here lie the central and richest Chinese provinces. On both sides of the lower Hoang-Ho is an immense delta plain, consisting generally of a deep alluvial soil of unparalleled fertility. This great plain has a length of not less than 700 miles, and a width varying from 150 to 500 miles, and probably maintains a denser population than any other portion of the earth's surface of similar extent.

Rivers and Lakes.—No country of the world is better watered than China. The Yangtse-Kiang, which traverses the country centrally from west to east, has a course of some 3,000 miles, and forms a splendid inland waterway up which ocean steamers can sail for 1,100 miles to Ichang, a port opened to foreign trade. The Hoang-Ho, farther north, and next in size, has a course of over 2,600 miles, but is of much less value for commerce, being comparatively shallow, subject to tremendous and disastrous floods, and apt to shift its course. The Grand Canal connects the lower course of the Yangtse with that of the Hoang-Ho, starting from Hang-Chau Bay in the south, and being continued to Tien-Tsin in the north, thus completing what is said to be the most magnificent system of water communication in existence. This great waterway has, however, been greatly

CHINA

neglected, and threatens to become unnavigable, unless the necessary repairs are taken in hand. Besides these rivers and their numerous tributaries, the most deserving of notice are the Si-Kiang in the south, of considerable size but still more commercial importance, having at or near its mouth Canton, Hong Kong, and Macao; and the Pei-Ho, which, though much smaller, forms a waterway between Peking and the Gulf of Pe-chi-Li. The lakes of China, though rather numerous, are not individually of great extent. Perhaps the largest is Tung-Ting, in the province of Hunan, which furnishes an affluent to the Yang-tse-Kiang, and has a circuit of 270 miles. Po-yang, in the province of Kiang-Si, is 90 miles long by 20 broad, abounds in fish, and is remarkable both for the picturesque scenery around it and the numerous beautiful and populous islands which it encloses.

Climate.—The greater part of China belongs to the temperate zone, only a small portion of the south lying within the tropics. It has what is called an excessive climate, and has a far greater range of temperature than is usual within the same parallels of latitude. Peking, the capital, is nearly a degree south of Naples, and yet while the mean temperature of the latter is 63°, that of the former is only 54°. In summer, however, the heat reaches from 90° to 100° in the shade, while the winter is so cold that the rivers usually continue frozen from December to March. At Hong Kong, notwithstanding the influence of the sea in checking extremes, the thermometer in June and July, the hottest months, frequently stands at 90°, and in winter, from December to March, sinks nearly to the freezing-point. At Canton, snow, though rarely, has sometimes fallen. At Shanghai, lat. 31° 20', the range of temperature is still greater, the maximum reaching 100°, and the minimum falling at least 20° below freezing, or 12° F. In the south the climate is of tropical character, the summer heat rising to 120°. Here the southwest and northeast monsoons blow with great regularity, and nearly divide the year. In the north they are more variable. The violent hurricanes known as "typhoons" are not uncommon in the Chinese seas.

Geology.—The geology of China is very imperfectly known, but there is no doubt that all the leading geological formations are found in it. Primary formations are most largely developed in the mountainous regions of the west, where granite, gneiss, and primitive schists prevail. The same formations exist to a more limited extent in the southeast, where bleak mountains of granite give that district a distinguishing feature. The secondary formation, including the carboniferous and cretaceous system, occupies a considerable area, and the coal fields of China are perhaps the most extensive in the world. The Tertiary formation has its largest development in the northeast, and probably underlies the greater part of the alluvium which covers the surface of the Great Plain. A surface feature of a great part of northern China is the earthy deposit known as "loess," which covers an immense area both of mountain and valley, forming a yellowish-brown soil of the utmost fertility.

Mineralogy.—China is well supplied with useful minerals. Gold, though not thought to be very abundant, is obtained by washing the sand of several of the rivers, particularly those of

the upper branch of the Yang-tse, and in the mountainous and almost inaccessible regions of Yunnan. Silver is also found in the same regions. The quantity suffices for a large annual export, chiefly in payment of opium and other goods. Copper, besides forming the ordinary currency in limited mercantile transactions, is worked to a great extent for economical purposes. Mercury or quicksilver, in the form of cinnabar, is of frequent occurrence, and is much used both for coloring and medicine. Its poisonous fumes are even said to be inhaled like opium or tobacco. There is no want of iron either in the form of rich hematite, or in that of the carbonate of the coal-measures, but smelting is not carried on to any considerable extent. Lead, tin, and zinc exist, but owing either to a deficiency in quantity, or ignorance of the method of extracting them economically from the ores, the native product falls short of the consumption. Some authorities reckon the coal-fields of China as equal in value to all the other coal-fields of the world together, and some time they must certainly become of immense economic importance to the country. The area of the coal deposits in the southeastern part of the province of Hunan is about 21,700 square miles. The coal occurs both bituminous and as anthracite, but as most of it is raised without machinery, by the rudest forms of manual labor, the price is necessarily high, and the quantity mined is trifling. Defective means of communication partly account for backward state of coal-mining. Coarse mixtures of culm and earth are used as fuel to some extent, while other still more inefficient and less attractive compounds are employed. Among other mineral substances may be mentioned nitre, alum, gypsum, and more important than all, inexhaustible beds of kaolin or porcelain earth, the early possession of which by the Chinese, and their great skill in working it, has given the name of China to the beautiful ware which so long monopolized the market of Europe. Jade appears to be found in China in its most perfect form, and is there held in the highest estimation, being wrought into trinkets and into ornamental articles of various kinds. Various precious stones also are found, and agates especially are admirably wrought.

Zoology.—China is said to possess about 200 indigenous mammals and over 760 birds, most of which are found in adjacent parts of Asia, and some are also European. Among the *mammalia* are several species of the monkey tribe, one of them being the so-called Cochinchina monkey, marked by a striking variety of stripes and colors. Another is the proboscis monkey. Tigers and leopards were at one time so numerous as to have been regularly hunted in state by the emperors, but these animals have been extirpated except in certain localities, especially in Yunnan and Manchuria. A small species of wild cat is sought for as game, and served at table as a delicacy. Bears are frequently mentioned, and their paws are said to be in high request among Chinese gourmands. Other *carnivora* include the lynx, badger, civet, marten, and weasel. The elephant, rhinoceros, and tapir occur in some localities of the southwest. Both camels and elephants are employed as domestic animals, the former only in the north. Bats are numerous, and one large species is extensively used as food. To the indige-

CHINA

nous animals already mentioned may be added the wild hog, porcupine, raccoon-faced dog or Chinese fox, and several species of rats, more especially one of a yellow color, larger than those of Europe, and much prized for its skin. Several species of deer are met with, one being the musk deer. In birds, as above indicated, China is extremely rich. Pheasants in particular are famous, both for variety and for beauty. Among others are the well-known gold and silver pheasants, the former one of the most gorgeous of the feathered tribe. The peacock is also indigenous, and fowls akin to our common domestic variety. Birds of prey include eagles, falcons, owls, etc. Song birds, such as the nightingale and thrush, are well known and much appreciated. Water-birds of almost every kind abound, such as ducks, geese, swans, pelicans, etc. The mandarin-duck is a Chinese species famed for beauty of plumage. But perhaps the most remarkable water-bird is the fishing cormorant, the training of which forms an important employment, and is so complete, that when a bird has secured a fish which from its size he cannot manage singly, his neighbor darts down and assists him to complete the capture. The reptiles of China include several large serpents not regarded as dangerous, and one species at least which is very venomous. Tortoises are common, and are often kept in gardens and pleasure-grounds. No country is said to possess a greater number and variety of indigenous fishes than China. All its waters—its rivers, lakes, pools, canals, and even ditches—are full of fish. This is partly owing to the artificial means by which the natural supply is vastly increased. Boat-loads of water containing spawn are carried to distant parts and deposited in ponds, where the fry are fed with various species of lentils, or with yolks of eggs.

Botany.—The flora is naturally extensive and varied. In the south it is tropical in character, farther north, sub-tropical, and still farther there are many plants and trees identical or nearly so with those of middle Europe. Among trees commonly found in China the bamboo (if this gigantic grass should be called a tree), as in India, is perhaps the most valuable of all on account of the almost endless uses to which it is applied. Oaks of different species are common, and the economical uses of the various parts—the wood, bark, and galls—are perfectly understood. Even the acorns of some kinds are ground into flour, and converted into a farinaceous paste. Coniferous trees are represented by numerous forms of pine, yew, and cypress, some of them of great economic importance. The tallow and camphor trees abound, as also the mulberry and paper-mulberry. Palms are not abundant, but the coconut flourishes in Hainan and on the adjacent coast. The Pandanus or screw-pine is abundant in the south, but the date-palm is not known. The chestnut, walnut, willow, and hazel are all indigenous. The fruit-trees include the fig, mango, guava, lichi, loquat, orange, peach, pomegranate, quince, nectarine, plum, apricot, etc. Plants producing lacquer or varnish, and medicinal herbs of various kinds (including ginseng), are also well known. Among shrubby plants, the first place is unquestionably due to the tea-plant, of which further mention is made below. The next in importance is the

mulberry, on the leaves of which the silkworm is nourished. Among flowering shrubs or trees are the rose, with its numerous varieties, the hydrangea, the passion-flower, the lagerstrœmia, Indian pride, the Chinese tamarisk, various species of cactus, and the camellia. The Chinese flora is particularly rich in varieties of the azalea. Altogether the abundance of flowering-plants, shrubs, and trees is a feature of the Chinese flora. Dwarfing is a favorite occupation, and the Chinese horticulturists force plants to assume the most fantastic forms.

Agriculture.—This first of arts has always been held in the highest veneration in China. The emperor himself, to do it honor, repairs annually to an appointed spot with a large retinue, and, taking the plow in his hand, draws a furrow and sows some seed. A similar festival is held in the capital of each province. The agriculture of the Chinese has been lauded in high terms by almost all who have had opportunities of witnessing it. In the important processes of stirring the soil, eradicating weeds, economizing manures, and applying them in the form best fitted to nourish the crop and bring it to maturity, they display unwearied industry and no small degree of skill. On account of the dense population, every square foot of land that can be made to raise food is kept in constant service and at the highest point of fertility. Even mountain slopes are terraced and tilled, sometimes to the height of 8,000 feet, wheat or other grains being the usual crop in these places. The farmers slavishly follow a routine which has been handed down without change from untold generations, and not only display no inventive powers themselves, but obstinately refuse to profit by the inventions of other countries. Their implements generally are of the rudest description, and though improved European and American plows have been sent out and urged on their acceptance, they reject them with disdain, preferring a rude shapeless thing drawn by oxen or buffaloes. They appear to have no idea of raising improved breeds of horses and cattle by the arts so well known and practised in other countries. The only animal of which the Chinese can be said to have furnished us with an improved breed is the pig. Their asses and mules are also of good quality. Rice, as the principal food of the people, is the staple crop. The rich alluvial plains which cover a great part of the surface are admirably adapted for its culture, and, by careful management, yield amazing crops—not one merely, but in the south latitudes two crops of rice in the hot season, besides a winter green crop usually plowed in for manure. In the neighborhood of Ningpo, lat. 30°, where the summer is too short to mature two crops in succession, they are still obtained by an ingenious device. The rice is sown in seed-beds, and afterward planted out in drills. A first planting is made about the middle of May, and in two or three weeks after, a second planting is made in the intervals between the previous drills. When the first crop is reaped in August the other is still green, but being stirred and manured, and having plenty of light and air, comes rapidly forward, and is reaped in November. The whole steps of the process are conducted with the greatest care; and the water-wheel, worked by the hand, or by an ox or

CHINA

buffalo, is kept in daily operation from the first planting of the crop till it is nearly ripe. The reaping instrument is not unlike our sickle; and the crop, when not thrashed on the field, as is generally the case, is carried home and built up into stacks, resembling those of Europe. The rice is not always grown on alluvial flats, and there is a variety, known as dry-soil rice, that is cultivated like any ordinary cereal. The sides of the hills are often laid out in a succession of gently sloping terraces, and planted with rice in drills running across the declivity, thus admitting of being irrigated by streams which, retarded at every step, move slowly forward without acquiring any impetus. The same mode of culture is also practised with other crops. In the north the crops principally consist of our ordinary cereals and legumes—wheat, barley, pease, and beans. Vegetables of various kinds are generally grown for household use. Varieties of the cabbage tribe are extensively cultivated for the sake of the oil extracted from the seeds. The raising of green crops to be plowed in as manure is generally common where rice is cultivated. Two kinds of plants are chiefly employed; one of them, a trefoil, grown on ridges similar to those which form the intervals in our celery beds. Among other crops regularly and extensively grown may be mentioned sugarcane, used chiefly in a green state; indigo; the castor-oil plant; and numerous plants grown for their roots. The opium poppy is now so extensively cultivated that there is a much smaller demand for the imported article than formerly. Maize, buckwheat, and tobacco may also be mentioned as cultivated crops. Three other plants of the greatest economical importance, and so extensively grown as to form important branches of Chinese agriculture, deserve a separate notice. The first is the mulberry. Judging from the quantity of raw silk annually exported, and the general use of silk for dress, especially by the wealthier classes of the country, it is evident that a large area must be appropriated to the cultivation of this tree, and millions of persons employed in the different processes connected with it. The plants are not allowed to exceed from four to six feet high, and are planted in rows, often along the banks of canals. The mulberry farms are small, and are generally worked by the farmer and his family. The Chinese silk is much heavier than the Italian, and preferred in fabrics requiring lustre and firmness. Whether it owes its quality to a particular variety of mulberry, or to the climate or soil, has not yet been definitely ascertained. The second plant more particularly deserving of notice is the cotton-plant. That cultivated in China is of the same species as the ordinary American, namely, *Gossypium herbaceum*. The plant producing the yellow cotton used in the manufacture of nankeen appears to be of a more stunted habit than the ordinary cotton. It is chiefly cultivated in a level tract around Shanghai, forming part of the Great Plain, and is the staple summer crop. The culture differs little from that of other cotton countries, more especially the cotton districts of India. The third plant, the tea-plant, is cultivated in two varieties—*Thea bohea* and *Thea viridis*; and though it was long supposed that the former only yielded black and the latter green tea, it is now known that both kinds of tea are obtained

from each. The great tea provinces are Kwang-Tung, Fu-Kien and Che-Kiang. In the first the *Thea bohea* is grown, and the tea is of inferior quality; in the other two the *Thea viridis*, which yields all the finer qualities, and furnishes the greater part of all that is exported to Europe. In these two provinces, where the culture is most extensive and carried to its highest perfection, the tea plantations are usually formed in a deep rich loam, never on the low lands, but on the low hilly slopes. The tea farms, as common throughout China in all kinds of culture, are small, and their management, including not merely all the steps of the culture of the plant, but the preparation of the leaves for market, is almost invariably confined to the farmer and his family. The leaves are gathered thrice—about the middle of April, when the leaf-buds are beginning to unfold; about a fortnight after, in the beginning of May, when the leaves are fully grown; and when the leaves again are newly formed. The first gathering yields the finest and most delicate tea, but with considerable injury to the plants.

Manufactures.—In all the arts necessary to the comfort of life, and in not a few of those conducive to luxury, the Chinese have made considerable progress. One peculiar feature in their processes is the general absence of machinery. Except in a few industries the great moving power is manual labor. The silk stuffs of China have long borne a high name, and in several qualities are still unsurpassed. The loom in common use is worked by two persons, one of whom sits on the top of the frame, where he pulls the treadles and assists in making the various changes which must be made on the machine while in operation. By means of it the workman can imitate almost any pattern. The crapes and flowered satins, and damasks for official dresses, manufactured by the Chinese are particularly excellent. Everybody wears silks. It is the prescribed attire of high officers; soldiers are not considered in full uniform without it. The finer kinds of it form the ordinary dresses of the opulent, while the poorest manage to deck themselves in a coarser quality, at least on gala days. The embroidery of silk is carried on to an amazing extent, the perfection to which it has been brought creating an almost unlimited demand, both domestic and foreign, and employing myriads of the inhabitants. Steam-power has latterly been utilized in the reeling and spinning of silk. In cotton goods the Chinese make good and substantial fabrics, but the cheapness and good appearance of the foreign goods have given rise to a large importation. Nankeen, once so common in Europe, is still produced as before, and continues to form an important branch of domestic manufacture. Cotton mills and factories of the European type have recently been established. Linen seems not to be made in China. Flax is not grown, but a good substitute for it is found in the fibres of two or three plants, especially ramee, from which the beautiful grass-cloth, similar in appearance to linen, is extensively woven. Woolen fabrics are made only to a very limited extent. The consumption of leather in China is not great, and the manufacture of it is very imperfect. The porcelain of China has been famous from the earliest periods. The manufacture of the finest forms of it being long known to the

CHINA

Chinese alone, gave them the monopoly of the world, and though in elegance of shape and design they must now yield the palm to Europe, for quality of material and rich gorgeous coloring they still hold perhaps the foremost place. Paper is an article that has been made in China from an early period and with great success. The manufacture of glass is not carried on to a great extent, and this is one of the few arts which, at least in regard to its finer processes, the Chinese have condescended to learn from Europeans. In beautiful lacquered ware the Chinese continue unsurpassed. Much of its excellence appears to be owing to the fine varnishes which they have learned to extract from native plants. Except in some few articles the Chinese are backward in the manufacture of metal goods; but recently, and under European leading, machinery, small arms and ordnance, warships, etc., are being produced in the country; as well as soap, matches, and other articles. Many small articles made by hand display much finish and delicacy of workmanship. See CHINESE ART.

Trade and Commerce.—The inland trade of China, aided by the unusual facilities which it derives from a system of water communication, ramifying like net-work over all its provinces, is of incalculable magnitude. Its rivers and canals are so covered with junks and barges and swarms of smaller boats, that there does not seem much exaggeration in the estimate which makes the tonnage belonging to the Chinese little short of the combined tonnage of all other nations. The inland commerce, however, is much hampered by the rarity of good roads.

By the opening of the principal ports the foreign commerce has been immensely increased. Till 1842 the trade with foreigners, exclusive of that carried on by the mainland through the town of Kiachta, with the Russians, was jealously restricted to the mouth of Canton River. By the Treaty of Nankin, in the above year, Hong Kong was ceded to Great Britain, and Canton and four other ports were thrown open, namely Amoy, Fu-Chau, Ningpo, and Shanghai. At subsequent dates other ports have been added to the list of treaty-ports for foreign commerce, and about 30 ports are now open, the most northern being Niu-Chwang, in Manchuria, and the farthest inland being Chung-King, on the upper Yang-tse, some 1,500 miles from the river's mouth. Steamers do not go higher at present than Ichang (1,100 miles), the trade above this being carried on by junks or other craft. Several other of the ports are on the Yang-tse. Of all the Chinese ports, Shanghai, at the mouth of the estuary of the Yang-tse, carries on much the largest trade. In 1902 China agreed to open five new treaty ports, Chang-Sha, Ngan-King, Wan-Hsien, Wai-Chau, and Kong-Mun. In 1900 the number of foreigners in all treaty ports was 16,811.

Among the countries which maintain commercial relations with the Chinese the principal are: Great Britain and her dependencies, Hong Kong and India; Japan, the United States, and Russia. The latest trustworthy statistics relating to the foreign commerce of China are set forth in a report for the year 1901 by Mr. J. W. Jamieson, British commercial attaché at Peking. He shows that from 1896, when it amounted to little more than \$270,000,000, it had increased by the close

of 1901 to about \$315,000,000, a gain of nearly \$45,000,000. To this total the imports contributed a little less than \$200,000,000. During that period, however, the imports from the United Kingdom fell off more than \$6,390,000, and the exports thither by nearly \$1,800,000. The trade with Hong Kong and India, on the other hand, increased, but the returns in relation to Hong Kong are deceptive, because large quantities of Chinese produce are sent thither from Canton and other ports in southern China for transshipment to other localities in the Middle Kingdom. Imports from the United States during the period named have increased by \$7,380,000, and the exports from China to the United States by upward of \$3,000,000. The imports from Japan have increased more than \$10,000,000 in five years. Imports from the United States in 1903 were valued at \$18,303,369; exports to the United States from China, \$20,583,068. The Japanese merchants are especially welcome in China. Those Japanese who have most to do with China, study not only the language, but also the ideas derived from Chinese literature. That knowledge of the Chinese educational system and of the ideas inherited through it has a value even in the sphere of commerce, the Russians have already recognized; the same insight and sagacity mark the course of Germany.

The Chinese, in carrying on their extensive dealings, domestic and foreign, have in all 24 weights and measures, but of these only 6 are in common use, namely, the liang or tael = $1\frac{1}{3}$ ounces avoirdupois; kin or catty = $1\frac{1}{3}$ pounds avoirdupois; and picul = $133\frac{1}{3}$ pounds, used in weighing bulky articles; and decimals of a tael, called mace or tsien, candareen or fan, and cash or le, used in reckoning bullion, gems, drugs, etc., 19 cash making 1 candareen, 10 candareens 1 mace. The only native coin now current is the cash, a small piece of thin circular copper about three quarters of an inch diameter, with a square hole in the middle for convenience of stringing. Native silver bullion, called *sycee*, and gold bullion of similar shape, and usually stamped with the names of the banker and workmen, and the year and district in which it is cast, are used in larger transactions. All taxes are paid in *sycee* of 98 per cent fineness. Private bankers are found in all large towns, and some of them pay interest on deposits. They issue paper money, which passes current in the particular districts where they are known. The Mexican dollar has been made a current coin all over the empire. In Shanghai, Tien-Tsin, Han-Kow, and the northern ports, the tael is commonly used.

Railroads.—Railway communication is as yet very limited in extent. The lines actually in working order in 1903 were as follows: Shanghai to Wu-Sung (built in 1898); Kai-Ping to Pe-Tang; from Tien-Tsin to within a short distance of the Great Wall, by way of Chan-Hai-Ouan, and with connection to Peking (built by Li Hung-Chang's advice; length 298 miles). Of lines conceded and projected since 1897, the list is as follows: (a) The Russian line through Manchuria, with branch to Port Arthur and Niu-Chwang (begun in 1897, to be completed in 1904; length of main line 1,200 miles, branch line 600 miles). (b) The German Kiao-Chau line (total length, 621 miles). (c) The Franco-Belgian line from Peking to Han-Kow

CHINA

(the first line to be constructed by imperial decree). In the north, this line has been completed, and is in working order, as far as Pao-Ting-Fu, about 50 miles from Peking; in the direction of the Yang-tse the work has been completed as far as Sin-Yang, 120 miles from Han-Kow. The line will connect with Tai-Yuan-Fu and Singan-Fu. (d) The Anglo-German line from Tien-Tsin to Chin-Kiang with connections to Tsi-Nan; total is about 620 miles. (e) The English line from Tai-Yuan to Fu-Chau (298 miles); and two lines from Shanghai, one in the direction of Su-Chau, Chin-Kiang, and Nankin, the other to Hang-Chau and Ningpo. (f) The Belgium line from Canton to Han-Kow, with a junction at Hong Kong. (g) The French lines from Lavi-Kai to Yunnan-Fu from Lang-Son to Long-Chau and from Nan-ning-Fu to Peking.

People.—The Chinese belong to that variety of the human race which has been called Mongolian, but in them its harsher features, as represented in the genuine Tartars, are considerably softened. They are generally of low stature, have small hands and feet (the last often artificially made so small in the females as to become a deformity), an olive or yellowish complexion, much modified by the degree of its exposure to the open air, prominent cheek-bones, depressed nose, eyes obliquely turned upward at the outer extremities, black hair, scanty beard. In bodily strength they are far inferior to Europeans, but superior to most Asiatics, their great assiduity and patient endurance of fatigue making them highly prized as laborers throughout the Indian Archipelago. Perhaps the finest physical specimens of the race are to be seen among the coolies or porters of Canton. The Chinese are deficient in courage, yet often display great contempt for death. In their moral qualities there is much that is amiable. They are strongly attached to their homes, hold age in respect, toil hard for the support of their families, and in the interior, where the worst kind of foreign intercourse has not debased them, exhibit an unsophisticated and pleasing simplicity of manners. In the great mass these qualities are counterbalanced, or rather supplanted, by numerous vices—treachery, lying, gambling, opium-smoking, etc.

Population.—The Imperial treasury department of China has recently published an official census of China in connection with a readjustment of the imposts that are destined to pay its war indemnities. It appears from this census, that the empire contains 426,000,000 inhabitants, and that China Proper—with its 18 provinces—contains 407,000,000. In the provinces, the number of inhabitants per square mile is greatest in Ho-Nan and least in Kan-Su. In the dependencies the density of population is far less than in China Proper, especially in Mongolia and Turkestan, which are very sparsely populated. The density is 22 times greater in Ho-Nan than in Manchuria. The population of the United States as a whole is about 20 persons per square mile. The population of China Proper is about 300 per square mile. If the whole population of the United States and 40,000,000 more were crowded into the State of Texas the density of population would be about equal to that of the Yangtse Valley and of the plain extending north and south between the lower courses of the Yangtse and

the Hoang rivers. Ngan-Hui but a little larger than New York State has more than three times the population. Che-Kiang province, slightly less in area than Kentucky, has more than 10 times the number of inhabitants, and between Kwan-Tung and Kansas the ratio is 21 to one.

No census figures based upon official returns are obtainable for the dependencies, and the nature of the population in these regions makes even a close estimate difficult. The data for 1903 may be given approximately as follows:

China	407,330,000
Manchuria	8,500,000
Mongolia	2,580,000
Tibet	6,430,000
Sungaria	600,000
East Turkestan	600,000

426,040,000

Language and Literature.—The Chinese language belongs to those Asiatic languages commonly called monosyllabic, because each word is uttered by a single movement of the organs of speech, and expresses in itself a complete idea or thing. All Chinese words in the Peking tongue end either in a vowel, a diphthong (in which, however, each vowel sound is distinctly pronounced, making the word often to appear of more than one syllable), or a nasal. Of such simple words or roots there are about 450. But the accent of many of these words may be varied by the speaker in four or five different ways, so as to produce a corresponding variety in their meaning, by which means the number of simple words or roots amounts to about 1,200. The relations of words are ascertained by their position in a sentence. Hence Chinese grammar is solely syntax. Since many words similar in sound are different in signification, while in writing each idea has its peculiar symbol, the number of words represented by writing, without reckoning those peculiar to certain dialects, is perhaps 10 times greater than those distinguished by the ear. The number, in fact, is reckoned at 50,000. In writing and printing the characters are arranged in perpendicular columns, which follow one another from right to left. In its origin Chinese writing is hieroglyphic or picture-writing, with the addition of a limited number of symbolical and conventional signs; and anyone well acquainted with these symbols has obtained a good introduction to the reading or writing of Chinese. The larger number of Chinese characters are formed by the combination of such hieroglyphs and signs. But as one such character by itself seldom determines the sound, an additional word is conjoined for the purpose; so that the great mass of Chinese written words consists of an ideographic and a phonetic element. Native grammarians divide their characters into six classes.

The confusing variations in the forms used to represent Chinese proper names in English is an almost inevitable result of the characteristics of the former language. Uniformity seems at present almost impossible of attainment, but the practice of compounding geographical names in such a way as to bring into prominence the significance of certain often-used monosyllables has considerable to recommend it. For instance, "Fu" (or "Foo") added to the name of a place, as Ningpo-Fu, indicates a city ruled by an official directly responsible to the head of a pro-

CHINA.



1. A Street in Tungehow.

2. Reception Hall of Temple.

CHINA

vincial government; that is, a city of the first class. In the form Ningpofu, the force of the compound is weakened. "Chau" (or "Chow") indicates a city of the second class; that is, a city subject to the ruler of a greater city; and "Hien" is used for a city of the third class; that is, a city of a dependent province. "Shan," meaning "mountain," is found in the name of the province Shan-Si ("Mountainous West"), Shan-Tung ("Mountain Province"), etc. "Kiang," meaning "stream," is found in the names of rivers, as Yang-tse-Kiang, Min-Kiang, Si-Kiang, etc. (the form Yang-tse-Kiang River being patently incorrect), and in the names of the provinces Kiang-Su, Kiang-Si, etc. In the case of names that have been longest known to the English-speaking world, or most frequently in use, such as Peking, Nankin, Shanghai, Ningpo, etc., although uniformity demands the compound form, the present form has been fixed by constant usage. Among other Chinese terms in general use in referring to places and institutions are the following:

Fu-tai, or Foo-tai, the governor of a province.

Godown, the place for storing goods.

Haikwan, the customs duties.

Hwang, emperor, yellow.

Li, a Chinese mile (equal to one quarter English mile).

Likin, an inland tax on foreign goods in transit.

Nui-Ko, privy council.

Shih, imperial.

Tael, a coin equal to one and a third ounces silver in weight.

Tao-tai, governor of a city.

Ting, a city of a small province.

Tsin, a prince.

Tsin-wang, a prince of the blood.

Tsung, clan, family (sometimes board).

Tsung-li-Yamen, a cabinet council of advisory powers having charge of official relations with foreigners.

Tsung-tuh, viceroy or ruler of more than one province.

Yamen, office (for official business).

The Chinese literature, from a geographical, ethnographical, and historical point of view, is unquestionably the most comprehensive and important of the whole of Asia. The printed catalogue of the Emperor Kien-Lung's library is composed of 122 volumes. In the five canonical or classical books, called 'King' are contained the oldest monuments of Chinese poetry, history, philosophy, and jurisprudence, some portions of which belong, perhaps, to the most ancient writings of the human race. Confucius, in the 6th century B.C., collected them from various sources, and in this collection they have been pretty faithfully handed down. In lyrical poetry the most distinguished names are Li-tai-pe and Tu-Fu, both of whom flourished at the beginning of the 8th century A.D. The romantic poetry of the Chinese, though void of poetic beauty, is valuable for the insight it gives into their domestic life.

The art of making paper is said to have been known in the 1st century, and printing from wooden blocks, in the 7th or 8th century, hundreds of years before these valuable arts were invented in Europe. In China literary eminence is the sure avenue to the highest honors and offices of the state, appointments being

obtained by competitive examination; hence "the *literati* are the gentry, the magistrates, the governors, the negotiators, the ministers of China." Naturally among the more comfortable classes, education of the kind which promises to be best rewarded is almost universal. For the lower classes also every village throughout the empire has its school, but the subjects taught are of the most elementary description; attendance is far from general, and is limited to the male sex. In 1898 an "Imperial University of China" was established at Peking. The first allowance for the building was \$112,000, and an allowance of \$150,000 is annually made for its support. The sciences, arts, and philosophy are included in the curriculum. Dr. William A. P. Martin, an American missionary and educator, was appointed first president of this institution, and three of its professors were from the United States. Students occasionally go abroad for study at foreign universities or technical schools. A few newspapers and periodicals are published in Chinese, especially at Hong Kong.

Religion.—Judging by the multitude of temples and joss-houses seen in every quarter, and the endless number of ritual acts performed on high festivals and in the ordinary intercourse of life, the Chinese are a most religious people. The religion of the state is Confucianism, an ethical system founded by Kong-Fu-Tse or Confucius, about 550 B.C. Another religion is Taoism, introduced about the same time by Lao-tsze, and numbering a good many adherents. (See CONFUCIUS, LAO-TSZE.) Among the great mass of the people a form of Buddhism prevails, or a curious mixture of religious ideas and forms. In the conduct of daily life they are under the dominion of innumerable superstitions, living in dread of demons whom they constantly endeavor to ward off or appease. Their belief in feng-shui, or the influence of "aspects," works against the introduction of railroads and other modern improvements. Attempts to introduce Christianity were made by the Nestorians as early as the 6th century, but the celebrity of the Jesuit missions has thrown all others into shade. The Roman Catholics now claim to have about 1,000,000 adherents among the Chinese. Various Protestant bodies carry on missionary operations in China. There are now probably over 50,000 native Protestants. During the Boxer massacres many native Christians were martyred.

Customs, Manners, Dress, etc.—Among the Chinese, politeness is carried to an extreme. They scrupulously avoid all contradiction in conversation, and are careful not to use any offensive or irritating expressions. From the same source arises the tedious, frivolous, and often absurd etiquette and extravagant compliment for which they are remarkable. But even here a wish to please and gratify is sufficiently evident. An invitation to dinner is written on a slip of red paper, and is sent some days before; it is usually in this style: "On the —— day a trifling entertainment will await the light of your countenance; Tsau Sanwei's compliments." This is followed by another card naming the hour. The dinner itself is sumptuous, wine and spirits are drunk freely, and the whole affair goes off with a great deal of boisterous merriment. Fresh pork, fish, and fowls form the staple articles of food, with vegetables of various kinds. Beef and mutton are rare.

CHINA

Opium and tobacco are in common use. The usual beverage among all classes is tea, of which the Chinese consume enormous quantities.

In ordinary cases, strict separation prevails between the male and female branches of a household. Betrothment is entirely in the hands of the parents, and is conducted through the medium of a class of persons called *mei-jin*, or go-betweens, whose office of matchmaking is considered honorable. The marriage itself is conducted with much ceremony, gay processions, and other convivialities. Besides one wife, strictly so called, a man who can afford it may have several subordinate wives. A wife may be divorced on several grounds that we should deem frivolous. Infanticide is common among the very poor, the female children being almost the only victims.

The return of the new year is an occasion of unbounded festivity and hilarity in China, and New Year's Day is a universal holiday for rich and poor. At this season all accounts are expected to be adjusted, and if this is delayed or neglected the creditor has sometimes recourse to the expedient of carrying off his debtor's door. On New Year's morning all shops are shut, and this usually continues for several days. There are also various festivals throughout the year, but no weekly day of rest. Gambling is universal in China. Porters play by the wayside while waiting for employment; and hardly has the retinue of a great official seen the latter enter the house when they pull out their cards or dice and squat down to a game. Dress, like other things, undergoes its changes in China, and fashions alter there as well as elsewhere; but they are not as rapid or as striking as among European nations. Regarding dress, there are certain restrictive laws in operation. The mandarins or officials have some special peculiarities of dress, and their respective ranks are indicated by the nature of the knob or button they have on the top of their hats. The wearing of the queue or pig-tail is perhaps the most noticeable external peculiarity of the Chinese as regards costume. The headdress of married females is becoming, and even elegant. The copious black hair is bound upon the head in an oval-formed knot. No caps, bonnets, hoods, or veils are worn abroad; a light bamboo hat, or an umbrella, protects from the sun. The extraordinary practice, peculiar to China, of compressing the feet of females (especially those of the better class) into unnatural form and dimensions has been already alluded to.

Dwelling-houses are generally of one story. The common building materials are bricks, sifted earth, matting, or thatch for the walls, stone for the foundation, brick tiling for the roof, and wood for the inner work. The fronts present no opening but the door. The walls are often stuccoed, but not painted, and the bricks are occasionally rubbed smooth with stones, and the interstices pointed with fine cement. The general internal arrangement of a Chinese dwelling of the better sort is that of a series of rooms of different dimensions, separated and lighted by intervening courts, and accessible along a covered corridor, communicating with each, or by side passages leading through the courts. Streets are generally so narrow as to be mere lanes. The most characteristic Chinese structures are the pagodas, built

generally with a number of stories, each marked off from the rest by a peculiar projecting portion.

Government, Laws, Army, and Navy, etc.—The government is an absolute despotism. The emperor unites in his person the attributes of supreme magistrate and sovereign pontiff, and theoretically as "Heaven's Son" is to heaven alone accountable. In practice, however, the rigor of this despotism is considerably softened, and the greatest blot upon the Chinese administration is the corruption which in every form that ingenuity can devise is rampant throughout the empire. The emperor's principal ministers, four in number, two of whom are Manchus and two Chinese, form an interior council chamber, and beneath them are a number of assessors who form the principal council of state. The government business is distributed among seven boards, having cognizance respectively of the conduct of civil officers, of revenue, of rites and ceremonies, of military affairs, of naval affairs, of crime, and of public works. Another board, the Tsung-li-Yamen, has the charge of foreign affairs. There is, besides, an office of censors, 40 or 50 in number, who go out into the empire as imperial inspectors, and are privileged to make any remonstrance to the emperor without endangering their lives. The provinces, either singly or by twos, are under a governor and sub-governor, and each province has also a chief criminal judge and a treasurer. Particular magistrates preside over particular districts and cities, and instead of being permanent are changed about once in three years. The great object aimed at is to maintain a strict surveillance and mutual responsibility among all classes; in other words, to imbue them with fear of the government, and infuse a universal distrust. The chief protection of the people is in a body of laws, called *Ta-Tsing-Liuh-Li*, that is, "statutes and rescripts of the great pure dynasty" which are held in high regard, and agreeably to which, with occasional violations, all public functions are discharged. The new code of laws that is being drawn up for the Chinese empire is to be the work of a Japanese professor of law. The Chinese army has been subjected to a certain amount of reorganization in recent years, and an attempt has been made to introduce improvements from the European countries. In each important town there is a Manchu force, and the total Manchu army is estimated at 270,000 men, with an organization of its own. There is a Chinese army separately organized from this, forming a kind of militia, supposed to include some 800,000 men. A considerable number of the men are now armed with rifles of European pattern, and the European drill has been partially introduced. Li-Hung-Chang, when governor of Pe-chi-Li, organized a corps of instruction drilled and trained on the European model, and this comprises 10,000 men. Numbers of Krupp guns are mounted on the fortifications; and there are arsenals superintended by Europeans. The navy contains several cruisers and other war vessels of the modern type, but the Chinese lost their most powerful ships in the war with the Japanese, and their navy is now of comparatively little strength. Three protected cruisers were built in 1897 in Germany for the Chinese fleet, and several sea-going torpedo boats, ordered before the war, have been also added. The reve-

CHINA

nue of the empire is derived from customs, excise, and the land and salt taxes. Calculating on the basis of statistics for 1901, if the customs duties, including the sum payable in lieu of the *likin* or in land-transit dues, be computed at about 10 per cent, the revenue, if payable in gold, would be about \$20,000,000.

China had a national debt before the war of 1894-5, and at the close of that contest she assumed a new indebtedness of \$187,500,000. The aggregate indemnity which the foreign powers were to receive by way of indemnity for the Boxer outrages in 1900 was \$337,500,000, payable in 39 annual installments. The whole of the Chinese customs revenue, if payable in gold, would be equivalent to about 6 per cent of the indemnity.

History.—The early history of the Chinese is shrouded in fable, but it is certain that civilization had advanced much among them when it was only beginning to dawn on the nations of Europe. The names of numerous dynasties belonging to a period two or three thousand years before Christ are still preserved, but how much, if any, of this early history is authentic, cannot be determined. The Chow dynasty, which was founded by Wu Wang, and lasted from about 1100 B.C. to 255 B.C., is perhaps the earliest that can be regarded as historic, and even of it not much more is historic than the name. Wu Wang is said to have divided the kingdom into 22 feudal states, and the continual internal rivalries which resulted from this policy encouraged Tartar raids and invasions. Under Ling-Wang, one of the sovereigns of this dynasty, Confucius is said to have been born in 551 B.C. During the latter half of the period in which this line of sovereigns held control, there appear to have been a number of rival kings in China, who lived in strife with one another. Chow-siang Wang, who was the founder of the Tsin dynasty, attempted to bring all China under his rule, but he was unsuccessful. His great-grandson, however, a national hero of the Chinese, who was the first to assume the title of "Hoang" (emperor), and henceforth called himself Tsin-She-Hoang-Ti, succeeded in accomplishing this. He ascended the throne at the age of 13 and fixed his capital at what is now Segan-Fu. Besides building a great palace there, he constructed numerous roads, canals, and buildings, throughout the country. He completely defeated several Tartar and other neighboring tribes, and suppressed a revolt in his own country. The Great Wall of China was begun by his command, and it was he who ordered all books treating of the past history of China to be destroyed. The present name of China is derived from the name of this dynasty. The Tsin dynasty ended with Hoang-Ti's grandson, who gave way in 206 B.C. to Lew Pang or Kaou-Te, the founder of the Han dynasty. Toward the end of the 2d century, or soon after the beginning of the 3d century, of the Christian era, the empire was divided into three states, which were again united under one ruler before the end of the 3d century. During the 10th century the right to the throne was disputed, and civil war raged till an adjustment took place by the establishment of the Tsung dynasty under Tae-Tsu 960 A.D. Under this dynasty great progress was made in literature and art. Incursions of Tartar hordes now pressed the Chinese so hard that they called in the aid

of the Mongols or western Tartars, who freed them from their oppressors, but gave them a new master in the celebrated Kublai Khan who founded the Mongol dynasty, and removed the capital from Nankin to Peking. His ninth descendant was driven from the throne and a native dynasty called Ming again succeeded in 1368 in the person of Hungwu. A long period of peace ensued, but was broken about 1618, when the Manchus gained the ascendancy, and after a war of 27 years established the existing Tartar dynasty in the person of Tung-Tchi. According to the Chinese, their dynasties, 26 in number, embrace a period of about 5,000 years, during which between 200 and 300 sovereigns have held the throne. The earliest authentic accounts of China, published in Europe, are those of Marco Polo, who visited the country in the 13th century. The first British intercourse was attempted under Queen Elizabeth in 1596, but the vessel sent did not reach its destination. A trade was subsequently established at Canton by the East India Company, but no direct intercourse between the governments took place till the embassy of Lord Macartney in 1793, which was well received by the Emperor Keen Lung. A second embassy in 1816 by Lord Amherst, was treated with insolence, and returned with a letter from the emperor to the prince regent, bearing among other things, "I have sent thine ambassadors back to their own country without punishing them for the high crime they have committed." The arrogance thus manifested could not fail, sooner or later, to bring on a collision; and accordingly, in 1841, the British, on being refused redress for injuries, partly real and partly alleged, proceeded to hostilities, and after scattering almost without a struggle every force which was opposed to them, were preparing to lay siege to Nankin, when the Chinese found it necessary to sue for peace. A treaty was then concluded, by which the five ports of Canton, Amoy, Fu-Chau, Ningpo, and Shanghai were opened to British merchants, the island of Hong Kong ceded to the British in perpetuity, and the payment of \$21,000,000 agreed to be made by the Chinese. In 1850 an insurrection headed by Hung-seu-Tseuan or Tien-Te, who gave himself out as a descendant of the Ming dynasty, broke out in the provinces adjoining Canton, with the object of expelling the Chinese Tartar dynasty from the throne, as well as of restoring the ancient national religion of Shan-Ti, and of making Tien-Te the founder of a new dynasty, which he called that of Tae-Ping, or Universal Peace. After the capture and execution of Tien-Te his place was taken by Hong-Sin, who identified Shan-Ti with the God of Christianity, and regarded himself as called of God to make the old true religion of China again predominant. For a long period the insurgents succeeded in maintaining their ground against the imperial forces, and it was not till after the lapse of several years that the latter were enabled in some degree to quell the rebellion. Notwithstanding the cruel retaliation by the victorious party, and the wholesale massacres perpetrated on the insurgents, they were unable to stifle the spirit of revolt. In October 1856, the crew of a vessel belonging to Hong Kong were seized by the Chinese on the allegation that they had been concerned in a piratical attack on a Chinese vessel. The men, on the

CHINA

remonstrance of the British authorities, were afterward brought back, but all reparation or apology was refused. The attitude taken up by the Chinese in this matter led to a declaration of war, and in 1857 the Chinese fleet was almost totally destroyed, and Canton was taken by the French and English troops. A treaty was at length concluded with Lord Elgin on behalf of the British, by which important privileges were secured; but an attack on the French and English ambassadors who were on their way to Peking to have the treaty ratified by the emperor led to the renewal of the war. The allied forces marched toward Peking, and after twice defeating the Chinese troops entered the city. This brought the Chinese to their senses, and the treaty was ratified. Meantime the Tai-Ping rebellion had been gaining strength, and the trade of Shanghai and Canton was materially interfered with. The British thereupon decided to assist the Chinese in quelling the insurrection, and the services of a young engineer officer, Capt. Charles Gordon ("Chinese Gordon," afterward so well known in connection with the Sudan), were lent to the government for that purpose. The rebels were gradually driven from their posts, and in July 1864, Nankin, their last stronghold, was taken. But the empire was still disturbed by rebellion in other parts. The Mohammedans in Chinese Turkestan, wishing to take advantage of the weakness to which the Chinese government had been reduced by the Tai-Ping rebellion, revolted almost simultaneously, but apparently independently, with those in the province of Yunnan in the southwest. In both cases the rebellion resulted in the temporary separation of the provinces from the empire. In 1883 hostilities broke out between China and France in consequence of the warlike operations of the latter in Tonkin and her claim to the protectorate of the country; but the matter was arranged early in 1885. In 1894 war broke out with Japan in connection with Chinese misgovernment in Korea, and in this struggle Japan had almost an uninterrupted success both by land and sea, driving the Chinese out of Korea, and invading China at several points. Peace was concluded in 1895, China agreeing to give up Formosa and pay a large indemnity to Japan, to open additional ports to foreign commerce, and to recognize the independence of Korea. In the autumn of 1897 two German missionaries were murdered in the province of Shan-Tung, and the admiral commanding the German squadron on the China station immediately effected a landing in the bay of Kiao-Chau, which, after much discussion, was finally leased to Germany early in January 1898. This acquisition of Chinese territory by Germany attracted much attention among other powers whose interests were likely to be affected, and was followed at brief intervals by the leasing of the town and harbor of Port Arthur in the Liao-Tung Peninsula to Russia, and the leasing of the bay of Wei-hai-Wei to Great Britain. On 22 September, a *coup d'état* was effected by the dowager-empress of China, who had acted as guardian to the Emperor Kwang-Su during his minority, by which the emperor was again placed under her dominion. The prompt remonstrances of the representatives of the powers at Peking served to prevent any extreme procedure on the part of the empress and her advisers, and the emperor afterward nominally regained power,

but early in 1900 was reported to have abdicated.

In September 1899, Secretary Hay instructed the United States representatives in England, France, Germany, Russia, Italy, and Japan to invite from those governments a presentment of their intentions in regard to the treatment of the commerce of foreign powers in the newly acquired spheres of influence, with special reference to the treaties existing between China and the United States, advising that China be regarded as heretofore as an open market for the world's commerce, and that all possible steps be taken to establish much-needed administrative reforms and to preserve and strengthen the imperial government in its integrity. On 20 March 1900, Secretary Hay announced that all the powers concerned had accepted the proposals of the United States, and that he would consider their consent final and irrevocable. In May 1900, a secret society, colloquially known as the "Boxers," rose in the provinces of Shan-Tung and Pe-chi-Li and massacred native Christians and European missionaries. The Boxers were encouraged by the empress-dowager and the palace-party at Peking, who placed themselves at the head of a movement directed against foreigners. The ministers at the European legations in Peking—Sir Claude Macdonald being at the head of the British legation—determined to requisition guards for their protection, and these arrived on 31 May. On 4 June the Boxers destroyed the Peking-Tien-Tsin Railway, and by cutting communications isolated the Europeans in Peking. Soon after the chancellor of the Japanese legation and Baron von Ketteler, the German minister, were murdered in the streets. In hope of relieving the legations, Admiral Seymour put himself at the head of 2,000 European troops and blue-jackets, and set out from Tien-Tsin for Peking, but had to retire. Meanwhile the Chinese had been manning the Taku forts at the mouth of the Pei-Ho, and making preparations for closing the entrance to the river. The commanders of the allied fleets—British, French, Russian, and German—in the Gulf of Pe-chi-Li gave notice to the Chinese to desist. The Celestials in reply opened fire on the European vessels, 17 June, whereupon the allies bombarded and destroyed the forts. The allied forces entered the foreign city of Tien-Tsin on 23 June, and the native portion of the city was taken on 14 July. All this time the legations at Peking were closely besieged and constantly bombarded. The smaller legations having been destroyed or rendered untenable, their occupants, together with a number of native Christians, took refuge in the British legation, which, from its extent and strength, offered a better prospect of protection. The legation was ill supplied with provisions, and the defenders were reduced to extremities, when the relief force of 12,000 men comprising British, American, French, German, Russian, and Japanese troops, captured Peking on 15 August. Before the arrival of this force the empress-dowager and her court, with the Emperor Kwang-Su, had fled from the capital, and it was impossible, with the troops and transport available, to overtake them.

Troops of various nationalities had been despatched from Europe to North China with all possible haste, and Count von Waldersee, the

CHINA

German commander, had been accepted by all the allies as commander-in-chief, but international jealousies soon made themselves apparent, and complications seemed likely to ensue. In October 1900 it was announced that Lord Salisbury had concluded an agreement with Germany by which the two powers bound themselves to the principle of the "open door" in China, to abstain from seeking to obtain for themselves any territorial advantage, and to take such steps as might be agreed on for the protection of their interests, as against any other power seeking territorial aggrandizement. Subsequent military operations consisted chiefly of punitive expeditions to the south and west. Negotiations for peace were at once entered upon. On 4 December the powers sent a joint note to the Chinese peace commissioners, demanding among other acts, the execution of the leaders in the massacre of foreigners and the payment of an indemnity, which in October 1901, was fixed at \$735,000,000. On the ratification of the indemnity agreement, the foreign troops were withdrawn from Peking. Later, through the good offices of the United States, the indemnity was reduced, being fixed at \$337,500,000.

Events of 1902-3.—On 7 Jan. 1902, the imperial court returned to Peking, making a brilliant entry. The Europeans witnessed the pageant from the Chien-Men gate, the privilege being in contrast to the old rule under which no foreigner could see the passage of royalty through the streets. The empress after her return showed marked courtesies to the ladies of the foreign legations, introducing the innovation of receiving them in person. Four important edicts were issued on 10 January, placing political science and western arts among the subjects of study at the Hanlin Academy; creating Chang Po-Hsi minister of education, with instructions to draw up a new scheme of education; appointing Wang-Wen-Shao director of the board of railways and mines, and nominating Yuan-Shih-Kai director-general of the Peking-Shan-hai-Kwan Railway. Among other edicts was one urging the abandonment of foot-binding. On 12 February there was made public an Anglo-Japanese agreement. Its aim was the maintenance of the independence of China and Korea, and the prevention of territorial dismemberment. In a note sent to the other powers, by France and Russia, the two allied governments reserved "the right to consider, eventually, means of ensuring the defense of their own interests." The Manchurian convention between China and Russia was signed 8 April. Manchuria was therein acknowledged as an integral part of China, the right of sovereignty and of administration was restored (as before Russian occupation), and the period of the evacuation was reduced to 18 months, the withdrawal to be in six months after signature of the convention, and to be completed in successive removals from three specified portions of Manchuria. Russia also consented to restore conditionally the Shan-hai-Kwan, Niu-Chwang & Sin-min-Ting Railway. A rebellion in the south of China caused much disturbance, in the aim of founding a Chinese dynasty, in lieu of the present Manchu rule. The conflict between political and railway interests among the various powers concerned with concessions continued during the

summer. On 15 August, Tien-Tsin was formally restored to China. The protocol tariff agreed to by the powers was signed 29 August, and a scheme for abolishing "likin" (q.v.) throughout the empire was embodied in a commercial treaty with Great Britain, signed 5 September. On 8 October the Russians restored, but in form rather than in reality, the first portion of Manchuria named in the Manchurian Convention. In December it transpired that the German government had imposed upon China, as a condition of the former's consent to evacuate Shanghai, the promise not to grant any preferential rights opposed to the principle of the "open door," and also a stipulation that the forces of all the powers should evacuate the port simultaneously. The government of the United States had in November invited the powers to submit to The Hague tribunal the settlement of the question whether the war indemnity should be paid on a gold or on a silver basis, our State department alone, of all China's foreign creditors, showing disposition to relieve China from the additional burden imposed by any fall in the market value of silver, and the arrival of the period for the payment of the first installment of the indemnity, 1 Jan. 1903, made the question a serious one for the Chinese government. The final payments will be made in 1941. The delay of Russia in carrying out the convention provision regarding the evacuation of Manchuria became in the spring of 1903 a cause of international uneasiness, and the policy outlined by the czar's government regarding relations with China gave rise to so much inquiry and protest that an attempt was made by Russia to explain away her demands. The still occupied portions of Mukden and Kirin were, by the convention, to be evacuated in April, and the final and complete withdrawal from the province was to occur in July; but in spite of Admiral Alexieff's proclamation announcing that there had been a removal of troops on 23 April, an incessant activity after that date in railway development and transportation of supplies and ammunition, the building of barracks, and other signs of permanent occupation, tended to keep up the general distrust of Russia's intentions. The rebellious state of certain portions of the Chinese provinces during 1903, gave cause of serious anxiety to the viceroys, and their fear of anti-dynastic movements even led to the discountenancing of public meetings in Shanghai, called to urge government resistance to Russia's demands. The increased intercourse which has been manifested during the past few years between China and the western powers has tended to bring the vast population into closer touch with western ideas, and the question of to-day is no longer whether the Chinese will tolerate the presence of the foreigner, but which particular nation shall obtain the greatest privileges within the Celestial empire. The rivalry of the different powers concerned in the opening up of China is very keen, and the issue is yet undetermined. Great Britain desires to see the empire freely opened to all traders irrespective of nationality, while Russia and France aim at the acquisition of portions of Chinese territory for their own exclusive advantage. It is this conflict between a partition of China into spheres of influence and the maintenance of the empire in its full integrity,

CHINA AND JAPAN

while opening it up to foreign trade that occupies the attention of diplomats.

Chinese in America.—It is estimated that there are about 100,000 Chinese in the United States, and that 30,000 of them are in San Francisco. There is a considerable Chinese colony in New York, and there are small colonies in Philadelphia, Boston, and Chicago. Though they do not belong to the educated classes, 95 per cent. of them can read and write. A daily paper in the Chinese language is published in San Francisco and another in New York.

Nearly all the Chinese in the United States come from the single province of Kwang Tung, the most populous of the eighteen provinces of the Chinese Empire. Its capital is Canton. Six counties of this province send out most of the emigrants to the United States. In 1900 an educated Chinese from the province of Shan Tung said that beside himself there were only two Chinese in the United States that came from any province in China other than Kwang Tung. The inhabitants of this province have for centuries been more adventurous and fonder of traveling than the rest of their fellow-countrymen, and they are always ready to face danger if there is a good chance of profit.

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China and Japan. When in 1823 in response to the Russian ukase claiming exclusive possession of the Pacific coast of North America to the 51st parallel, John Adams told the Czar's minister, Baron de Tuyl, that "we should contest the right of Russia to any territorial establishment on this continent, and that we should assume distinctly the principle that the American continents are no longer subjects for any new European colonial establishments," he not only gave the first clear expression in action to the Monroe Doctrine (q.v.), but he unconsciously perhaps dictated the future history of the Pacific Ocean and in large measure the peaceful progress of China and Japan through American influences. Thus ushered into the world's politics, the United States, after resisting the Czar's demand and by diplomacy alone forcing it back to parallel No. 55, prevented the Russian advance southward in America, and

later gained California, Alaska and the Aleutians with a vast front on the Pacific, then whitened by our whaling and trading ships. Once California and Oregon ours, the incentive was quickly given to tap the markets of Asia and awaken the hermit nations to commerce. After Monroe, Fillmore. The latter, on the day that Mutsuhito, the present emperor of Japan, was born, 3 Nov. 1852, ordered Commodore M. C. Perry (q.v.) to proceed, by the shortest route—around the Cape of Good Hope—to Yedo Bay to negotiate a treaty. Perry's triumph was a "brain victory," won by tact, patience, and consummate knowledge of human nature and especially the Japanese variety of it. He opened a new era in the treatment of Oriental nations, showing how, apart from force, the door of international brotherhood might be opened. On the spot at Kurihama, where, in 1853, stood the pavilion for the reception of the President's letter, rises to-day in Perry Park the memorial monolith inscribed in gold by Marquis Ito (q.v.), to the erection of which the Mikado, leading his people, subscribed. At Yokohama, where the conferences of Commodore Perry and Professor Hayashi were held to discuss ethics, humanity, and treaty business, and the first industrial exhibition in Japan of American tools, inventions, and products was held, the United States consulate and the Union Church have been upreared. Thus led forward, the hermit Japan entered the school of experience whence she was to emerge as the pupil of the Anglo-Saxon nations and the champion of their principles in Asia, and the teacher of China and the middle term between the civilizations of the Orient and the Occident. After her own political commotions, consequent upon the clash of old and new ideas, Japan from 1870 engaged the service of hundreds, yes even thousands, of Yatoi (hired specialists) from America and Europe, to rebuild the foundations of the empire, and for 30 years besides sending thousands of her sons abroad, put herself under the tuition of an army of teachers from western countries who were active in every department. Yet what has been in phenomena true of Japan has been in the working of leaven true of China also, only her larger mass hindering the visibility of real progress. Perry's success with Japan really opened a new era in the whole Chinese world of eastern Asia. The spirit of America's commerce, education, diplomacy, missions, and the political policy of the United States have been the greatest factors not only in the awakening of China, but in influencing and regulating the policies of the aggressive European nations in their dealings with China and the neighbor nations of the Far East. Japan, contrary to popular notions, is a very young nation, being, according to the unanimous verdict of critical scholarship and all the evidence in hand, no older than the Germanic nations, coming to national self-consciousness in the 5th century of the Christian era. Naturally then she has taken quickly to western culture in the 19th, as in the 5th and 15th century. The Chinese, being an old race, with all the limitations of senility are more slow in their mental movements than the Japanese, who show all the peculiarities of a young race. Yet in both empires progress, through the combination of old and new forces, has been real.

Surveying the past fifty years and especially

CHINA AND JAPAN

what has been done within the 20th century, it is well to show still further wherein the Chinese and Japanese are alike or different from each other, and also wherever they have human traits in common and systems in harmony with or in contrast to the nations of the West. We may appraise changes actually wrought and see how far these movements or evolutions are to be attributed to agencies within or without these countries. There are those who consider Japan almost wholly a self-reformed nation, while others think that all transforming agencies have come from without. The truth lies in the golden mean between these extremes of opinion. China's vastness of area and density of population prevent even keen western observers and students and certainly the average Occidental, from any clear perception of leavening principles and transmuting elements within so large and venerable body politic. They may note what is phenomenal, while they are usually blind to the psychic changes in the Far East. Hence, for example, the real energies of the native secret societies and sects within the Chinese empire cannot be definitely gauged, yet that they have been for centuries a real force, frequently showing themselves in both bloodless and bloody manifestations, the last being the so-called Boxer insurrection of 1900, can be demonstrated. That these sects yet exist in great potency is certain. Until Western diplomatists discern that China, equally with Turkey or Russia, and what survives of old Japan, is a church nation, with a fixed creed upheld by the government and maintained by force, and that China always has been, and is still, a persecuting nation, there can be no sound diplomacy. Failure to see this adds mystery to the Chinese problem and accounts largely for the discreditable surprise at the Boxer outbreak in 1900, foreseen by the missionaries, but to the approach of which so many diplomatists in Peking were blind. This politico-ecclesiasticism based on the Confucian writings and philosophy, is the foundation of a social system that has survived the fall of over 30 imperial dynasties, and is still at once the most potent check upon and the choicest weapon of government, whether by pure Chinese or alien rulers like the present Manchus. Hence to attack that dogmatic system is treason in a native, a horrible offense in a foreign missionary, and only tolerable in the Mahometans because they are so numerous and powerful. The maintenance of this dogma by the sword of the normal magistrate, himself *ex officio* an orthodox Confucian, has been the cause of persecutions during the ages with bloodshed abundant. This is the real reason of so many reactions, and of repeated disappointments. China has again and again raised hopes among Occidental people that she was about to modernize her laws and people, only to dash the expectation of optimists to the ground. Even in this 20th century she has, after founding schools and universities, apparently on modern ideas, even appointing American and European officers and teachers, cast these persons aside, and neutralized their methods, ostensibly because natives or Japanese were preferred, but in reality to maintain her dogma of Confucian orthodoxy, because the decrees from Peking demand adherence to Confucianism. Whatever modifications China has made in her system are

as yet simply external, nor will there be any real progress in the western sense of the word until Chinese bigotry and persecution are abandoned and the union of church and state given up. The plea of China is that innovators under the pretext of progress are seditious and that reforms by natives mean republicanism and thus destruction of the dynasty. But this is only another phase of that Chinese indirection of mind, which Dr. Arthur Smith in his book on 'Chinese Characteristics' has so exposed with such masterly skill. The certainty of the Chinese union of church and state, the instances of bigotry and bloody persecution, and the great slaughter of Chinese in the name of orthodoxy during past ages, making the Chinese government a shedder of blood for opinion's sake, quite equal to Russia or the mediæval states of Christendom, are shown by that life-long scholar of Chinese, J. J. M. DeGroot of Leyden, in his monograph, 'Sectarianism and Religious Persecution in China.' In weight of scholarship based on original research this work outweighs all that has thus far been written on the subject of China's politico-religious status. In the future these sects will doubtless play a very important part, and probably with more effect on China's internal structure, than either the Tai Ping rebels or the "Boxers" (q.v.). Such possibilities must exist as long as China represses thought and opinion for conscience' sake by her absolutism in religious matters. Nor is it likely that she will find any better solvent for her problems than the complete separation of church and state and the granting, not only of academic freedom, but of perfect liberty of conscience to her people. So long as she refuses to grant such liberty, both in the school and to the masses, there will be no end to internal disorders and to foreign complications. In this matter of self-reformation, as the past has already proved, the elements tending to reconstruction and the evolution of the Chinese into the modern man are most likely to arise from among the natives who have been educated or helped by the teachers from foreign countries. The overwhelming majority of such men of modern mind are Christian, though others are far from lacking. Almost all the knowledge of China by the Western world comes from aliens, who have studied, surveyed, and described the country, and who in addition to propagating their dogmas have given the Chinese pretty nearly all the exact science they possess. One cannot ignore the services of those physicians, engineers, advisers, financiers, customs officers, who, with or without Chinese pay, have for a century or more served China's people. It was an American, Ward, who showed the possibilities of the Chinaman as a soldier. What other Americans have done in China is set forth in the book 'America in the East.' It was an American, S. R. Brown, "A Maker of the New Orient," for example, who established the first (Protestant) Christian school in China, brought the first Chinese students to America, and demonstrated the ability of the Chinese youth to absorb Western learning and methods. Among his pupils was Yung Wing, who, after graduating with honors from Yale College, brought to the United States under government patronage, six score Chinese lads as students, one of whom was Sir Liang Chang, the present Chinese envoy at Washing-

CHINA AND JAPAN

ton. In a word the efforts of the lay and clerical teachers, helpers, and healers of the Chinese, especially since the opening of the ports, and within the last 60 years, reveal a force that has, in the peaceful American, rather than the conquering Russian way, helped to give credibility to the prophecy of one of the greatest of China's foreign teachers, S. Wells Williams: "The regeneration of China will be accomplished like the operation of leaven in meal, without shivering the vessel."

The Japanese are not compacted wholly of Oriental stuff. They differ from the Chinese physically and psychically. Though they form a race having in it many elements, Tartar, Korean, Malay, Nigrito, etc., their basic aboriginal stock, the Aino, is very probably a branch of the Aryan family of humanity, and the Japanese are thus allied in some measure with the "white" races. In mind and temperament they differ from the Chinese, not only as insular people dwelling on volcanic soil constantly shaken by earthquakes, may be supposed to differ from continentals inhabiting stable lands in river valleys, but also in culture and aims. The Chinese are ethical, the Japanese esthetical. In China filial piety is the cornerstone of civilization, in Japan it is loyalty. The archipelago produced the samurai—soldier and scholar in one. The mainland generated the literati who despise the soldier. In Japan the centre and abiding element of all is the dynasty, one and unbroken during written history, for fifteen hundred years. In China the binding force is the social system, independent of figureheads in the capital, abiding through many changes of rulers but ever crowned by a religious system that tolerates no other and looking on all other cults as alien and dangerous. Even in old Japan we discern a church nation. Religion and politics though not nominally united were practically one, and bloody persecutions were far from unknown. Even yet the germs of fanaticism and persecution are not wholly eradicated though perhaps nearly so, nor can they be so long as academic freedom is curtailed or religion is in any way made an official engine of government. In the early ages of unwritten history the conquest of the primeval tribes of similar ethnic stock and of the Ainos in Japan was by the force of the dogmas of Shintoism (the primitive religion or Divine Way) as well as by superior arms and valor. The Mikado was the regent and deputy of the gods of heaven and earth, and church and state were one. When Buddhism with its superior refining and elevating forces came to civilize the Japanese barbarians, this Aryan cult overshadowed Shinto, but was none the less the great breeder of action and reaction in the life of the nation. When its missionary activities ceased and the nation was Buddhaized, Buddhism became itself the superior influence in politics, reducing the Mikado to a shadow, thus paralyzing the central authority, making the throne a mystery instead of a power. Buddhist monks organized as armies and not only overawed the emperor, but among warring feudal lords decided questions at issue even on the battlefield. Smitten down by Nobunaga (1533-82) and its power for a time curtailed, Buddhism was again patronized by Iyeyasu (1542-1616) in 1600 and made the popular religion, and its priests sent as sleuth hounds to

hunt down Christian believers. Roman Christianity was thus suppressed by the sword and ever vigilant inquisition. While the people were ruled by the bell of the bonze, the gentry and scholars who studied Confucianism and made it into a code of ethics, a philosophy and a creed, were given to understand that no departure from the official orthodoxy approved in Yedo would be tolerated. As matter of fact scores of executions of good men under the Yedo bureaucracy were brought about because of philosophical heterodoxy whenever and wherever associated with alleged sedition. It was in the name of the government, also, that imprisonment and death were denounced upon all who should believe in the "evil sect," or Christianity. When in 1868 the Mikado's government assumed supreme control of the empire (one of the powerful elements of the revolution being the revival of the ancient Shinto dogmas and ritual), the old death-dealing anti-Christian edicts were once more republished and enforced. Thousands of suspected Christians near Nagasaki were imprisoned and distributed all over the country. Under strong diplomatic pressure these prisoners were released. When the Japanese embassy in America and Europe saw themselves abhorred as uncivilized because of their persecuting tendencies, the edict boards were taken down. The natives were left free to organize churches and publicly propagate their Christian tenets and steady progress was made until in the constitution of 1889, full freedom of conscience was granted in the famous Article No. XXVIII.: "Japanese subjects shall, within limits not prejudicial to peace and order, and not antagonistic to their duties as subjects, enjoy freedom of religious belief." In his commentary on this article, the Marquis Ito, called the "Father of the Constitution," writes, "Freedom of conscience concerns the inner part of man and lies beyond the sphere of interference by the laws of the state."

Nevertheless, since there is no real liberty when conscience is bound or scholarship fettered, it is not yet true in Japan that perfect freedom of belief, writing and publication is openly allowed to any one in government pay. When in recent years a learned professor, examining the ancient literature showed that the use of Shinto (which was never formulated into a system or given its name until after the introduction of Buddhism) as an engine of government was not justified, and that the claims of the Mikado to a divine origin rested on very slender foundation, because lacking documentary proof, and that the whole system of ancestor worship was not a part of original Shinto, but was borrowed from China, he was punished by being put out of his position and retired on half pay. Yet, though academic and religious freedom is not absolute in Japan, it is relatively so full and generous, that it must serve as an increasingly powerful example to China, nor will China be rid of her manifold complicated difficulties with both natives and foreigners until such religious freedom, as is guaranteed to the Japanese in the fundamental law of the empire, be made the privilege of the Chinese also.

In so far as freedom in the deepest things affecting man is won and guaranteed, does other freedom follow. China's conceit of her theo-

CHINA AND JAPAN

retical perfection of government and of her own long supremacy among pupil nations prevented her from that recognition of the rights and privileges not only of other nations but of her own people. When a Chinese subject left the frontiers of his own country, he was ignored by his government and what happened to him abroad bred no concern at Peking. The Chinese rulers, to whom China's golden age was in the past, had no suspicion of any civilization superior to their own or knowledge of progress in other lands. To her court for ages had come only vassals or pupils, but in our day economic pressure from the outside, the Western men's desire for trade, the wars and aggressions of foreign countries compelled her to recognize merit and even superiority elsewhere, and gradually China began sending commissioners and embassies to other countries, the first modern instance being the appointment as Chinese envoy to the United States and European powers of the American, Anson Burlingame, who had won the confidence of the government at Peking. Much that was expected of this embassy failed to come to pass because the Western nations were probably as sturdy in their conceit as the Orientals and expected all changes in Asia to come by imitation of Western ideas and methods, whereas genuine international progress comes only by mutual influence. In 1868 the first real treaty made by China, in which the principles of the world's international law received recognition by the Chinese government was negotiated, when reciprocal privileges were granted to the two contracting powers, China and the United States. Mr. Burlingame negotiated other important treaties with Denmark, Sweden, Holland, and Prussia, but died in 1870, while arranging the terms of a treaty with Russia. We say "the world's" international law, for, so far from the name or the thing having originated in Europe, there was for centuries an international law in the Chinese world or orbit of influence in eastern Asia, governing the relations between the great central empire which occupied a position among subject and neighbor lands which the old Roman empire did in the western part of the Eurasian continent. The experience of this Far Eastern international law included such situations and episodes as the frequent despatch and reception of envoys of various grades and for many purposes, concerning which there was a fixed etiquette and a code of rules, the growth of centuries. Among the questions treated in these international communications are those of a "protected state," intervention, defensive and offensive alliances, treaties of peace, naturalization, the treatment of prisoners of war, rules in regard to pillage, even of places taken by assault, the protection or destruction of private or public property, the protection of exempted persons, especially women and priests, the guarding of the edifices of religion, art, and science, the respect due to messengers and bearers of flags of truce and concerning the instruments of war and means of destruction. One may thus easily see that Japan's hearty adoption of the modern laws of nations is no mere borrowing or imitation of things unknown, but that the diplomatic discipline of centuries enables her easily to keep equal step with the most highly civilized nations in those cour-

tesies and proprieties of which Christianity is the informing spirit. To these humane customs and usages Chinese, Japanese, and Korean history bears witness in hundreds of instances, but modern international law as formulated in the West received its initial recognition in China in 1868 under Burlingame. The epochal year of 1868 was the same in which Japan signed the treaties made with the Yedo shogun in the Mikado's name. Perry and Harris had treated with one who was only the Mikado's lieutenant at Yedo, but taught in the new school of international law by the American envoys the men who made the new government at Kioto formally adopted the principles of the laws of nations, and in frank acceptance of these principles began to relay the foundations of the empire, besides adopting representative government and civilized customs generally. When therefore the first great occasion arose between the two Asiatic states and always jealous nations, Japan and China, a still further development took place. Especially in the classic instances of the Peruvian ship *Maria Luz* in 1872, and the invasion of Formosa by the Japanese in 1873, was this seen. The Japanese government, having made inquiry into a cargo consigned to Callao, which was a human freight of Chinese laborers from Macao and held against their will, released the coolies and shipped them to China, a favor which was gratefully acknowledged by the Peking government. The so-called pagan nation of Japan achieved a great moral victory in breaking up a certain kind of slave trade which by euphemism was called the coolie traffic, while the very act shamed China into taking better care of her people. The results were soon manifest. For the first time China sent out commissioners to look after her own subjects in foreign lands, and her envoy going to Cuba and Peru refused to enter into treaty obligations with any South American state as long as a single Chinaman remained in the country against his will. Despite all protests of foreign consuls and ministers the Japanese persevered. Having freed their own *eta* or *pariahs*, they liberated the Chinese slaves in their own waters. This was the beginning of the establishment of Chinese consulates and legations throughout the world. To-day we find the Chinese increasingly social. The once hermit is in the world's market-place. The Middle Kingdom is represented in the Universal Expositions. Whereas it has been the rigid rule that a prince of the imperial blood must never spend a night outside Peking, we find, in 1904, the heir apparent to the throne, Prince Pu Lun, traveling in America. In 1874 after the wreck of a Riu Kiu junk on the coast of Formosa and the killing of the crew by the head-hunters, Soyeshima, the Mikado's minister, went to Peking and received audience with the Chinese emperor, standing upright though dressed in Western costume. He obtained from the Tsung-li Yamen the disavowal of responsibility over Eastern Formosa to which China laid no claim, and from the maps of which country it was omitted. Nevertheless after the interview, and when 1,300 Japanese soldiers had occupied Formosa for six months and chastised the savages, the mandarins of the capital, incited by foreign influence in Peking, awoke in wrath and shame, declared the Japanese intruders and menaced the island empire with

CHINA AND JAPAN

hostilities. Okubo (q.v.), sent by the Mikado to Peking, refused to treat in the matter except on the basis of international law. By this, war was averted and henceforth the world's legal standard was appealed to in all matters relating to Riu Kiu, Korea, and other questions in dispute, but with a tendency on the part of China to relapse into old tradition and custom, not being able to forget that she was no longer the "Middle" Kingdom. For example, the Chinese emperor Shunchi (1644-61) had written, "But now all lands both Middle (that is, China itself) and foreign, have become united into one vast empire, so that the whole earth has become one family and all the people of foreign countries are my children." When, therefore, Japan in 1870 occupied the Riu Kiu Islands and abolished their dual sovereignty, China protested, though not until 1874, and then in language of an exceedingly undiplomatic nature. After a long and somewhat acrid diplomatic correspondence, the controversy reached a dead-lock, when in the summer of 1879 Gen. U. S. Grant visited Peking. Prince Kung placing the matter before the American ex-President, bespoke the latter's assistance. This eminent American refused to pronounce any opinion on the merits of the case, but on his arrival in Japan, proposed unofficially to the Mikado's ministers a solution, and advised the Chinese government to withdraw their offensive despatches and appoint special commissions with full power to settle the matter. This proposal was accepted. An imperial commission was created by the Mikado's proclamation, and Mr. Shishido was appointed plenipotentiary commissioner to treat with Prince Kung and the ministers of the Tsung-li Yamen, the conference beginning its sittings on 15 Aug. 1880. The draft of the treaty was finished on 2 October, but the caprices of Chinese statesmanship were then beyond the range of ordinary prudence, and the action of the Peking government showed that they did not yet understand fully the meaning of the term "plenipotentiary commissioners." After 26 days' delay, 16 of them being after the date fixed for the signatures to the treaty, the matter was taken out of the hands of the high commissioners and transferred to the northern and southern superintendents of trade. This action turned the whole affair into mockery and began in the Japanese that sense of outrage which made them prepare for the possibilities of war, especially as the question of Korea (q.v.) was still unsettled.

In 1876, three years before, Japan had made a treaty with Korea as an independent state, which precedent, curious as it may seem, China assisted the United States, through Admiral Shufelt to follow, looking complacently on also while other nations, England, France, etc., did the same, each treating Korea as a sovereign and independent state. Nevertheless, while the notion of a vassal state's acknowledgment of dual sovereignty was unknown in the West, it still existed in the Chinese mind and the Middle Kingdom gave no sign of yielding her hold upon Korea as a vassal state. There seems little doubt then, that by 1880, the intelligent statesmen of Japan foresaw and the Japanese military men prepared for a war with China. Events and experiences in Korea during the next 14 years served but to change a suspicion into a determination.

When in 1894, this war broke out, it was evident that both nations had made vast progress in both material civilization, and in those gains which are associated with the triumph of mind in law and morals, revealing clearly by startling contrast both the homogeneousness and thoroughness of the progress of the smaller and the looseness of organization in the larger country. Japan, quickly responsive to a central will, seemed like an athlete in possession of all his powers, while on the other hand there was with "the boneless giant" progress only in lines and spots, the work of partially modernizing China having been chiefly that of a few resolute men, while the great body politic seemed to be insensitive, and vigorous for offence and defence only in portions. Strictly speaking, there never was any war between Japan and China, but only a war between all Japan and a few of the maritime provinces of China. The American, Ward, and the Englishman, Gordon, had shown what the average Chinaman could make of himself as a soldier, when properly drilled, commanded and influenced by example. Under these men, Li Hung Chang (q.v.) was converted to the value of the material forces in Western civilization. Adopting these, and being viceroy of provinces nearest to the capital, he organized an army drilled by German officers, and had the promontories of Wei-hai-wei and Port Arthur, guarding the sea gates of the capital, fortified and the Taku forts commanding the Pei-ho River rebuilt according to modern principles of defence and engineering. Gradually an efficient fleet of battleships, cruisers, and gunboats was organized. A beginning had also been made in China of railways and steamship lines. One part of China's vast system of revenue, "the imperial customs" of the empire, elaborated since 1863 under the British Sir Robert Hart, and honestly administered, has given China her surest source of cash income for general purposes and the purchase of foreign equipment of every sort. For an individual or government service to be free from bribery and routine corruption seems to the normal Chinaman something unearthly, and the imperial customs under Sir Robert Hart have won unbounded admiration from the Chinese. In 1894, when the war broke out which did so much to prick the bubble of Chinese prestige of greatness and mass, and which, paradoxical as it may seem, evoked mutual respect and drew the Chinese and Japanese more closely together in reciprocal understanding, China had, in addition to her military mobs in the various provinces, the beginnings of scientific military system. This in time might have become national. Even then as seen to undiscerning foreigners China appeared from a military point of view invincible. On the humane side of provision for sick and wounded soldiers and in the nobler features of civilization, China was woefully deficient. As soon as hostilities broke out the vast difference between the two nations was manifest. China went to war without surgeons, hospitals, nurses, or the manifold apparatus of civilization for protecting non-combatants, saving life and mitigating the horrors of war. China had not yet become a signatory to any of those conventions of nations in the interests of mercy, nor was there a Red Cross organization within her borders. Her recognition of the international code of war was

CHINA AND JAPAN

slow and her acceptance of it slight. On the contrary Japan, having her object lessons given by Christian missionaries had provided hospitals, surgeons, Red Cross Society and equipments for surgery, healing and hygiene, and these were in splendid condition, while 1,400 trained nurses were ready for work. Japan had in 1887 signed the Geneva and other conventions and had diligently educated her army officers in the commentaries and usages of the signatory nations, while her naval commanders were well versed in the laws of search and capture. When in 1894 her fleets and armies went forth into Korea, Manchuria, and China proper, there was with each field-marshal, besides a hospital corps ready to minister to friend or foe, an expert lawyer, versed in international law, who went as adviser to see that nothing was done by the Japanese which should infringe the laws of nations. Two notable books, 'International Law During the Chino-Japanese War,' by S. Takahashi, and 'La Guerre Sino-Japonaise au Point du Vue du Droit Internationale,' by Professor N. Ariga, the one from the military and the other from the naval college in Tokio, are the literary monuments of this habit of the Japanese, which, in 1904, has developed into a college of five international law experts. These, after being consulted at all points during the progress of the negotiations of 1903-4, have gone upon deck and field with the military and naval men into Manchuria to insure, in every detail, harmony with the laws of nations.

The war of 1894-5, which wrought such great results for the world at large, is worth reviewing in its main outlines, since it blew to pieces and forever China's doctrine of Whang-ti, or world-sovereignty, the tenacious adherence to which over Korea had brought on the war. After being again served by China as they had been in the Riu Kiu matter, the Japanese determined to take no further chances with her rulers. In Korea, after the bloody struggle in Seoul between the native Liberals and Reactionaries in 1884, followed by the armed conflict between the Japanese and Chinese troops, a convention was made dated 7 May 1885 between Li Hung Chang and the Marquis Ito, that both governments withdrawing their troops, would not again land soldiers in Korea without mutual agreement. For awhile there was peace in the Land of Morning Calm, but when the Tong Hak uprising took place, the soldiers from Seoul were overcome and the whole kingdom seemed to be in danger of anarchy, the pro-Chinese faction at court asked for aid from Peking to put down the rebels. Then to the amazement of the world the Chinese government violated the treaty of 1885 by first forwarding troops and then notifying the Japanese minister in Peking, using the words "our tributary state" concerning Korea. China thus reasserted her ancient claim of suzerainty over Korea as a vassal state, notwithstanding that Korea had been recognized as sovereign and independent by Japan and other nations. The government in Tokio interpreting this as a direct insult, on 12 June 1894 announced the despatch of a body of troops under strict discipline to Seoul and five days later invited China to undertake with Japan financial and administrative reforms in Korea in order to preserve the peace of the Far East. The Peking government

curtly refused and demanded the recall of the Japanese troops. The reply from Tokio was that pending an amicable settlement of questions in dispute, any further despatch of Chinese forces into Korea would mean war. China had already ordered her soldiers in Manchuria to cross the Yalu River, and having chartered the British ship Kow-Shing despatched 1,100 soldiers to reinforce the Chinese camp at Asan in Korea.

What follows the world knows. With astonishing secrecy and celerity, the armies of Japan occupied Korea and after the decisive battle of Ping Yang drove the Chinese out of the peninsula, crossed the Yalu and in Manchuria conquered an area larger than their own empire, while her navies wiped the Chinese fleet off the ocean and captured the great fortresses of Port Arthur and Wei-hai-wei. After annihilating nearly all the drilled troops of China at Ping Yang, the Japanese fought military mobs, making war chiefly with the forces of only a portion of the empire. During the war the majority of the Chinese people scarcely knew that there was any real hostilities adverse to their empire, nor did they learn for years afterward just what had happened, but the military success of Japan opened the eyes of Europe and enlightened some of the Chinese mandarins and scholars. To-day we find China with a new army, formed on modern principles and drilled chiefly by Japanese officers, while in June 1904, having become a signatory to the Geneva and other conventions made to mitigate the horrors of war, she has entered still the pale of civilization, which means the world in brotherhood.

The Japanese stung to the quick, because neither China nor Western nations had recognized them as highly civilized people, were confirmed in their pride and resolve to make the so-called white race understand and appreciate them, when Russia, France, and Germany joining to deprive them of the lawful fruits of conquest, forcibly compelled them to be satisfied with the cession of Formosa and indemnity in money. Had the Japanese been possessed of four battleships, they would in 1895 have declared war against Russia. As it was, they who never forgive an insult, resolved to nurse their wrath, keep it hot by buying battleships, and in cool science and unwearied perseverance began to invent explosive powders, perfect munitions and equipments and enlarge an army and a fleet that should some day wipe out the insult, and show that the Japanese count none on earth as their superiors. Meanwhile China, profiting by her fresh experience in humiliation, began to inquire more earnestly into the secrets of Western power. A tremendous impetus was given to the reading of all kinds of information about Japan and the Western nations, to the building of railroads and to the renovation of educational methods. The ferment of ideas caused something like a great reform movement in 1897, which, led by progressive literati and apparently sanctioned and even controlled by the young emperor, seemed apparently about to sweep over the whole empire. New schools and universities were planned and a newspaper called 'Chinese Progress' was published. The purchase and sale of official rank was to be abolished. The stirring and patriotic brochure "China's Only Hope," recommended

CHINA AND JAPAN

by the emperor, fed the flaming zeal of the reformers who were led by Kang Yu Wei. Even the abolition of the queue, the changing of the Chinese national dress, the adoption of the Christian religion, the calling of a national parliament and a journey of the emperor and empress dowager to Japan to see for themselves the pitiful condition of China were advocated in memorials. Reform seemed to be ready to spread like a prairie fire, when suddenly in September, Li Hung Chang was dismissed from office and the emperor virtually dethroned by the Empress Dowager. This act "carried within itself the fruitful seeds of the Boxer outbreak." Yet although the missionaries felt what was in the air, the diplomatists looked on the episode as a "Manchu family quarrel," and ignored the warnings of those living close to the masses of the people.

Meanwhile the disturbing influence of American prosperity and expansion were felt in both Europe and Asia. Within a year after Pittsburg achieved the supremacy of the world in the making of cheap steel, Russia, Germany and Great Britain "precipitated themselves upon the shore of the Yellow Sea, grasping at the positions which had been conquered by Japan and for the same reason,"—to obtain possession of the rich coal and iron deposits in Shansi, said to be "worth ten Pennsylvanias." Germany seized Kiao Chau, Russia Port Arthur and Great Britain Wei-hai-wei, in readiness for the supposed impending "Break-up of China" and its expected partition. The torpedo that sunk the *Maine* in Havana harbor interrupted the European programme, postponed the partition of China, and united the British, Americans and Japanese in the determination to keep China intact and the door of commerce open. In 1900 the United States, now a world power, was in Asia with force and had a policy—the policy of freedom and uplift—which for a century or more, the Americans in Asia, as traders, teachers, healers, and apostles of democracy and fair play had been steadily developing. Meanwhile in China the old territorial integrity could not be so ruthlessly violated nor the ancient social systems invaded without protest. The introduction of railways had thrown thousands of men out of old methods of employment. The tremendous commercial intrusions, which disarranged old customs and made the problem of livelihood to millions so very serious, brought on a fierce reaction both of the scholars and the people and especially of the Buddhist priests, creating an atmosphere and environment most favorable for the outbreak of another of those sectarian revolts against the official orthodoxy of China, to put down which the Chinese have shed more blood perhaps, than all the religious wars and inquisitions of Europe. This time the heresy was joined with and the cry raised in the name of patriotism. The heretics became the people called "Boxers" or the Fists of United Harmony. The triple pressure of hunger, superstition and patriotic revolt at the territorial incursions of the foreigner at last burst out into a storm, which in blind wrath against everything alien, smote first the railways and foreign workmen and then the teachers of the foreign religion and their converts. The mob reached Peking and surrounded the legations, which were hastily isolated, fortified and for months

successfully defended. The foreign powers hastily made preparation to defend and then succor their nationals, but the United States seemed to be the only one that beside its prompt despatch of a military force had a definite policy, which was in recognition of the sovereignty of China to relieve its own citizens and then withdraw its military from Chinese soil. It is absurd to suppose any real harmony or co-operation between the orthodox Chinese government and the heretical Boxers. Whatever be one's opinions on the subject or the form of the encouragement alleged to have been given directly by the Empress Dowager, it is a fact that no hostile shot was fired by a Chinese regular soldier or sailor, until the seven allied nations, in which the Americans were not included, had made war on China by firing on the Taku forts, 17 June 1900. Against this unwarranted proceeding and overt act of war the American Admiral Lewis Kempff protested, and in the crime of attacking peaceful Chinese he refused to participate, his conduct becoming the basis of the triumphal diplomatic policy of the United States government. Briefly stated, the situation was this: A riot of fanatical sectarians, moved by economic and patriotic motives, rose in rebellion against the government already impoverished and weakened by foreign aggression. When unable to put down the uprising in Shan-si, the Pei-ho valley and the vice-royalty from which Li Hung Chang had been removed—though the whole Boxer movement was wisely handled and thoroughly suppressed by able viceroys in the central and southern parts of China—the seven allied nations made war on China in the bombardment of the Chinese forts. When also the Chinese, of course, attacked their enemies in Siberia, the Russians perpetrated the massacre at Blagovestchenk and then marched their soldiers to Peking. The combined relieving force fought the opposing Chinese. The Japanese, having the largest and best furnished of the contingents, led the van. The Russians as very slow marchers came next, so that the American and British contingents had to march during the hottest hours of the day. It is certain that the celerity, character and discipline of the Japanese soldiery on this expedition excited the surprise and admiration of military critics of every nation represented, while on the other hand the familiarity of the men of Nippon with those of Muscovy bred contempt of Russian slowness, heaviness and low grade of intelligence in the *mujik* or common soldier of the czar.

After the capture of Tientsin 14 July, the Japanese or Americans alone could then have pressed on and relieved Peking within a fortnight, but jealousies and unnecessary delays kept the relieving column idle until 4 August. The unspeakable robberies, violation of women, brutalities and generally barbarous conduct of the most of the European troops, by the way and in the capital, demonstrated the hypocrisy of the claim to be called Christian and in contrast to the conduct of the Japanese proved that the terms "Oriental" and "Occidental," as applied to morals, are purely traditional and destined soon to pass away. The Imperial city was captured on 15 August, the Chinese court escaping to the westward and remaining away from Peking until January 1902. On 28 August bodies of soldiers, representative of the

CHINA AND JAPAN

eight allied nations, marched through the Forbidden City as a token of China's humiliation. Li Hung Chang was recalled to office and with Prince Chang commissioned to treat with the Powers, only one of whom, the United States, seemed to have a definite policy. During the "peace" negotiations, the Europeans kept up a series of attacks and massacres of Chinese called "punitive expeditions" which in general character were a disgrace to civilization. An indemnity equal to \$330,000,000 was imposed on the Chinese government in expiation of the Boxer outrages, and for her self defence in the war following the attack on the Taku forts. Various safeguards for the legations were arranged and agreed to, the importation of arms and ammunition prohibited, and the Tsung-li Yamen was transformed into the Ministry of Foreign Affairs which was to take precedence of the other ministries. Except legation guards, the foreign troops were to be withdrawn in September 1901. The Imperial edict of February 1901 accepted the terms imposed. On 9 April 1902, the Manchurian convention between China and Russia received the imperial seal. The Russians were to evacuate Manchuria within eighteen months, but to retain control over the railroads.

It was after this Boxer uprising that what we have called the Russian and the American foreign policies and systems of diplomacy had by contrast their most signal illustration. As soon as order was restored and the preliminary diplomatic arrangements made, the United States recalled all its military force, except a small legation guard, asked no favors in return for what had been done, and not only emphasized her recognition of China as a sovereign Power, but set a commendable example to the other governments by dealing justly with the Chinese in the matter and method of payment of the indemnity, thus illustrating again the fixed American policy of helping rather than taking advantage of Asiatic nations. Russians, on the contrary, demanding the right to occupy Manchuria with her troops and to make Port Arthur the terminal of her Siberian railway, began thenceforth the military possession of Manchuria, the building of the city of Dalny (q.v.), and the making of Port Arthur (q.v.) both a city and an impregnable fortress, and initiated various other enterprises on a vast scale, costing hundreds of millions of roubles, all of which suggested a prospective ownership in fee simple, rather than temporary occupation, notwithstanding that she solemnly covenanted to evacuate on the 8th of October 1903. The United States believing in the good faith of the Muscovite government and in accordance with her policy of recognizing China's sovereignty, appointed consuls for the three cities in Manchuria which by treaty agreement were to be thrown open to the trade of the United States. When the appointed time drew near, there was no indication of any purpose on the part of Russia to keep her agreement. As early as 28 July 1903, the Japanese government expressed to Russia its alarm at the Manchurian situation. When Russia formulated new demands at Peking and seemed to consolidate rather than relax her hold on Manchuria, showing also increased activity along the Korean frontier, doubts were raised in Tokio as to the limits of Russia's ambition. Through his minister in

Tokio, Baron Komura and his envoy, Mr. Kurino in Saint Petersburg, the Mikado notified the Czar through Count Lamsdorff that wishing to remove every cause of future misunderstanding he desired to enter "upon examination of the condition of affairs in the Extreme East, where their interests meet, with a view to a definition of their respective special interests in those regions." Negotiations were opened and after long delay on the part of Russia the Czar announced that while willing to respect the independence and territorial integrity of Korea, Russia declined to extend the same engagement to China and requested Japan to acknowledge Manchuria and its littoral as entirely outside her sphere of interest. The Czar furthermore requested the limitation of Japanese control in Korea, even proposing a mutual zone covering all Korean territory north of the 39th parallel. Other negotiations, followed by exasperating delays in Saint Petersburg, took place, Russia meanwhile heavily reinforcing both her army in Manchuria and her fleet in eastern seas, purchasing and transporting also large stores of ammunition and coal to Port Arthur. On the 5th of February, Japan telegraphed the termination of her negotiations, severing diplomatic relations with Russia and withdrawing her legation. Then followed hostilities, begun simultaneously, both parties claiming that the other had fired the first hostile shot. In the war that followed, the Japanese surprised Europe with the rapidity and brilliancy of their victories on land and sea, China remaining neutral except to take precautions against the violation of her frontiers. At the request of the German Emperor, the American secretary of state urged upon three of the nations most interested, the limitation of the area of hostilities, to which they promptly responded. From the side of the Japanese it must be remembered that they were smarting under the sense of long-continued Russian aggression in Saghalien and the Kuriles, begun very early in the 19th century. In 1861 a Russian man-of-war proceeded to the island of Tsushima, on which the Russian flag was hoisted and a settlement was made (though not until Japanese blood had been shed in resistance), which would have constituted a title of ownership had not Great Britain interfered. The Russians were finally compelled through British intervention to abandon their claim and leave. By the usual plan of "joint occupation," which in the Ussuri province of the Chinese empire had ended in China's loss of a territory as large as France and its incorporation into the Russian empire, the Russians gained complete possession of Saghalien. After the restoration of the Empire in 1868 it was foreseen by the Japanese statesmen that Russia would be their chief danger, for already signs of her movement in Korea were menacing. This fact was the strongest determining element in the creation in 1871, in place of the old clan contingents, of a powerful army and navy for national defence.

It is more than probable, as history has clearly shown in the past and as the racial constitutions intimate, that progress in Japan and China will proceed from varying levels and in different channels. In the island Empire the centre of national life is in the one unchanging dynasty and national amelioration has issued from the government downward. Any sure advance for Japan in the future will be from the

CHINA DECORATION

same source and in a similar direction. On the contrary among the Chinese people, to whom the existence of this or that dynasty makes no vital difference, reform will arise in and proceed through their social system and not from throne or court. In China real and permanent progress has been less through anything done in Peking than directly traceable to the work of men who rose from the people and who had been instructed by foreign diplomatists, teachers or missionaries. These men have trained the people through the schools, the press, the churches and the hospitals, reaching all parts of the empire by means of the printed word, book, tract, newspaper, or by personal influence upon China's leading men, whether in or out of office. In Japan before Perry's advent there were hundreds of men already enlightened, keeping eye on European aggression in Asia, and moving for the unification and reform of the nation. The great motive supplying the force of their lives came from no foreigner but from their own inborn patriotism and self sacrifice. Nevertheless, when fullest credit is given to the propulsive power of her Bushido, or the Knightly Code, it must be remembered that Japan, after her first contact with Europe, never was truly a hermit nation. For two hundred years or more the Dutch at Nagasaki fertilized the Japanese mind, keeping open not only the door of outlook on and information from Europe, but nourishing the Japanese intellect with exact science, varied knowledge and the applications of occidental methods especially in medicine and the mechanical arts. In 1853 it was strenuously charged by the Conservatives who wished the country kept shut that only the native "Dutch scholars" wanted the empire opened to commerce and western influences. In 1868 when the men rich in Dutch culture and the "Mikado-reverencers" gained possession of the imperial person in Kioto, they began to relay the foundations of the empire by seeking for knowledge in every part of the world. Teachers, advisers, engineers and experts of all sorts were imported by the hundreds, who during thirty-five years have literally taken off their coats and, by example and teaching, re-draft and handicraft have shown the Japanese how to do those very things which they are now doing so well. The configuration of the Japanese Islands has fitted them to profit to an extraordinary degree by the adoption of the forces of steam and electric communication at a time most needed, that is, immediately after the abolition of feudalism and in the transit to industrialism helping to unify them politically and consolidate them into a marvelously compact nation. In China, railways will re-distribute into wholesome evenness of proportions of tableland and littoral, the population now congested in the river valleys and alluvial plains, will develop and distribute the wealth of the mines, will abolish the almost periodical famines, and by adding healthy movement and contact of the inhabitants of distant provinces develop in the Chinese that patriotism (as distinct from race pride which is already so intense), the lack of which has been the cause of China's many woes, and will give that middle term of a large intelligent and practical body of men of affairs between the throne and the masses, so notable in Japan and which China so sadly needs. The progress in both Japan and China has neces-

sarily been thus far mostly of the material, educational, and economic sort, for neither the Chinese nor the Japanese take kindly to the abstract thought or science of the West. It is an exceptional thing to get a Japanese or Chinese to listen patiently to the presentation of even the outlines of a metaphysical or abstract argument or proposition. Hence, therefore, in its doctrinal form, Christianity has made but slight progress, and the chief experience noted by foreigners in the reception of an Occidental creed of any historic name by Chinese or Japanese has been its simplification. It seems quite certain that Christianity as known and practised by the countries of the Extreme Orient is to a very hopeful degree expressed in practical forms or in reform. Nor is it at all likely that in accepting what Jesus taught these peoples will ever receive or assimilate also that Greek philosophy, Roman tradition and doctrinal achievement, and the ethnic peculiarities which form so large a part of popular Christianity in America and Europe.

The chief role which the Japanese are to play in the future—with probably the development of reserves of power greater than the average Occidental suspects in them—will be as the teachers of the Chinese, who number one fourth of the population of the world, by interpreting to the sons of Han the civilization and systems of the West, themselves acting as the middle term between Occident and Orient.

This article does not pretend to picture or set forth in detail the external progress which Japan and China have made in revenue or development of natural resources, or to tabulate by statistics the possession of the material forces of the West as seen in railways, steamships, lighthouses, telephones, etc., and the manifold application to the comforts and conveniences of life of western inventions. So long as the ideas bred by a rigid Confucianism or the hardening of those ancient Chinese and Japanese traditions and dogmas which once were living forces of progress, but which have long since become obstacles to growth, prevailed in these lands, there could be no real progress. All changes which seemed progressive would be mere surface efflorescence rather than organic and vital growths. With the adoption of universal principles of truth, as formulated in science and illustrated in the lives and work of good men and women, the old mists of superstition pass away, the matted growths of tradition are plowed up, and the mental soil of the Chinese and Japanese lies open to receive the seeds of new and perennial progress. Those who look beneath the surface have every reason to believe that the progress of the past fifty years in China and Japan has been as genuine, and will be as fruitful for the good of the race as that made in the western world.

WM. ELLIOT GRIFFIS,
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China Decoration. The decoration of china, and, indeed, of all kinds of clay wares, falls into two groups: (1) Controlled by method, and (2) controlled by producer. The former group deals with the fact that a decoration can be introduced at any stage of the manufacture; the latter concerns itself with the various handicrafts employed.

CHINA, GREAT WALL OF

Decorations may be used under the glaze, either on the unburned or burned clay; in the glaze, as a natural coloring; on the glaze, after the hard-glaze fire.

Decorations on the clay usually take the form of *sgraffito* (incising); inlaying, or *pâte-sur-pâte*; or painting with diluted clay. In the two latter it is important that the inlaid or overlaid clay should be similar in composition to the main body, or the fire will cause them to separate. The body piece, formed either in a mold or upon the wheel (see POTTERY), is kept quite damp, and the design, lightly sketched in India ink, is carefully followed. In inlaid work a channel is tooled out of the body, and filled in with clay of a different color. In *pâte-sur-pâte* no cutting out is necessary, but usually the background is stained a dark color and the design is laid on in white. The beautiful works of M. Solon are of this class.

On the burned ware under-glaze decoration may be either painted or printed. Most of the modern hotel and restaurant ware is printed under the glaze.

For some classes of work a coloring added to the glaze itself is very effective. By this means are produced the flowing and flashed effects much followed by the Japanese and by many French ceramists. In America the Dedham Pottery has worked in this direction.

For work over the glaze a lower fire is employed, many more colors are available, and the processes of decoration include painting, gilding, printing, and ground-laying.

Ceramic colors are made from certain metallic oxides with which are blended a fusible flux, so that the mixture may melt and attach itself to the glaze. Various fluxes are in use. They are composed of red lead, borax, and quartz sand in varying proportions. These ingredients are melted together, and the resulting glass is finely ground. For blues the oxide of cobalt is used; for greens, those of copper and chromium; for yellows, antimony and lead; for reds and browns, iron; for dark brown, manganese; and for grays, nickel and iridium. Gold produces rose color and purple, and a pink is also made from tin oxide and chromic acid. In some cases the colorant and the flux are melted together; sometimes they are united only in the grinding-mill. For under-glaze work, as well as for the coloring of clays and glazes, the list is not so full. Some of the oxides fail under the higher temperature, and must therefore be confined to over-glaze use.

In the second group, decoration is considered as a handicraft. Division of labor is the rule in a manufactory, and thus a piece of china may pass successively through the hands of the ground-layer, the painter, the printer, and the gilder, together with those of many minor operators. To the ground-layer falls the task of distributing an even tint over the whole piece or upon some part of the design. Using a stiff oil,—linseed boiled with litharge or lead acetate.—he dilutes it with turpentine, and brushes a thin coating over the china. This coating he dabs with a soft linen pad, and then spreads the color, which is a fine dry powder. A certain quantity adheres to the oil, and a smooth tint is the result. If only part of a design is to be covered, the free portions are painted with a water-color mixed with molasses. The work is oiled and dusted as before, and is then immersed in water,

when the water-color is washed up, taking with it any of the ground color which may have settled upon it.

The painting of china scarcely needs a description. The colors are as already explained, and the painting depends upon the personal skill put forth. The colors are mixed in turpentine and fat oil just as the painter pleases, for each artist mixes his own palette. The colors change somewhat in the fire, but not as much as is often supposed. The main difference is a great gain of brilliance.

The gilder is mainly employed to embellish the work of others. He uses pure gold, as pure as it can be purchased. This is received in the form known as "coffee gold," a brown granular mass. Mercury is added of about the same weight as the gold and the whole is ground perfectly fine. When mixed with the proper oil this can be used freely as a paint, and the oil and mercury are driven off in the fire. Gold thus prepared needs to be burnished after firing; but there is another form of gold, known as bright or liquid gold, which is much cheaper, and therefore largely used on common wares. In this case the gold is dissolved and the solution is mixed with certain oils. The fire removes everything but the metal, which is left as a brilliant film on the china.

Printing from copper plates has been in use ever since 1756, but for many years has taken an inferior position. At first it was employed for fine engravings and decorative subjects, but lately only for borders and outlines. The pattern is engraved upon a plate of planished copper, and the printer makes this plate quite hot upon his stove. The color, mixed in a very stiff oil, is also kept hot, and with this the engraving is charged. An impression is taken upon thin paper, and this print is handed to a woman who cuts away the superfluous paper and presses the print on to the china. A bath of cold water removes the paper, and the color, rendered hard by the low temperature, remains firmly fixed. The fire completes the process.

Lithographic printing is now very popular in china decoration. The process was introduced from France some 12 years ago, and for a long period the prints were made abroad, but recently the more successful manufacturers have established their own lithographic departments. The prints are made in the usual way from stone, except that no color is applied to the stone itself. The impression is taken in varnish, and the color is dusted on the printed paper. On account of the transfer the order of impression is reversed, the print which is first on the paper becoming uppermost when the impression is transferred to the china. The paper used is double, consisting of a sheet of tissue paper cemented on to a stiff backing. The stiffness is necessary to withstand the pressure of the machine, and when printed the tissue is stripped from the sheet and proves flexible enough to accommodate itself to the surface of the ware. The printing is done in vitrifiable colors, of course, and the finished china is fired in the usual way.

China, Great Wall of, the largest artificial structure on the face of the earth, a barrier extending for about 1,500 miles in the north of China Proper, of which it partly forms the boundary. Its western end is in the deserts of

CHINA INK—CHINCHILLA

central Asia, its eastern reaches the sea to the northeast of Peking. It was erected as a barrier against the inroads of the barbarous tribes, and dates from about 214 B.C. It is carried over height and hollow, and avoids no inequality of the ground, reaching in one place the height of over 5,000 feet above the level of the sea. Earth, gravel, brick, and stone were used in its construction, and in some places it is much more substantial than in others. Its greatest height, including the parapet on its top, is about 50 feet, and it is strengthened by towers at regular distances.

China Ink, or Indian Ink, a black solid substance, which, when rubbed down with water, forms a very pure black indelible ink. It has been used in China from time immemorial, and both there and in Japan is employed for writing, small brushes being the implements made use of. In Europe it is used by draftsmen, artists, etc. It is manufactured in various ways and from various materials, but consists essentially of fine lampblack incorporated with a gluey substance, the whole being dried and consolidated into cakes and sticks. Some kinds are made with animal or ivory black, others with lampblack got from camphor or oil of sesame. There is generally added some perfume—a little musk or camphor. Many attempts have been made to imitate Chinese ink, some of which have been tolerably successful. Almost all the imitations consist of carbon ground up with gum, gelatine, or fish-glue, but the quality and tint may vary according to the special carbon employed and the process of manufacture. Good Chinese ink should have a velvety black appearance, with a gloss which becomes very conspicuous on rubbing. The color it gives on paper should be pure black and homogeneous, and if water be passed over it it should not run or become streaky. See **INK**.

China Root, the root or rhizome of *Smilax china*, a climbing shrubby plant closely allied to sarsaparilla, for which it is sometimes used. *Vitis sicyoides*, a species of vine, is known by this name in Jamaica.

China Rose, the name given to a number of varieties of garden rose chiefly derived from *Rosa indica* and *R. semperflorens*, both natives of China. The name is also given to *Hibiscus rosa-sinensis*, one of the mallow tribe, common in China and the East Indies, and an ornament in greenhouses.

China Sea, that part of the North Pacific Ocean bounded on the north by Formosa, on the northwest by China, on the west by Anam and the Malay Peninsula, on the southeast by Borneo, and on the east by the Philippines. It contains numerous islands, receives several considerable rivers, and forms the important gulfs of Siam and Tongking. The currents in this sea are very mutable, depending much upon local circumstances.

China-tree, Wild, a common name for the soapberry-tree (*Sapindus marginatus*). It is a handsome tree, sometimes growing as high as 60 feet. The flowers are white and the oval berries are very saponaceous. It grows from Florida westward to Arizona and northern Mexico, and in southern Kansas. The wood is very hard, and heavy, weighing nearly 60 pounds to the cubic foot.

China-ware, the name given to porcelain made in the Chinese empire and imported as "China ware," now chiefly confined to the soft porcelain made in England, of which bone-ash is the characteristic ingredient. This class of ware is called "bone china" by the potters and dealers of America.

Bone-ash was used at Bow and at Chelsea, near London, as early as 1750 and has been extensively employed ever since. Bone china consists of kaolin, pigmatite, or Cornwall stone, and bone-ash. The clay and rock are found in Cornwall, England; the bone is largely imported from America.

The proportions in a dry mix are about as follows: Kaolin, 40; stone, 20; bone-ash, 40. The heat at which the kilns are burned ranges from 2,300° to 2,400° F. Bone china is not made to any great extent in America, though some few manufacturers have put it forth as a side line. The particular merits of this ware lie in its snowy whiteness, and in the soft glaze which makes it possible to produce very beautiful decorations over the glaze. For rich services this class of china is unrivaled. See **PORCELAIN**.

China Wax. See **WAX**.

Chinandega, chē-nān-dā'gā, Nicaragua, a town 26 miles northwest of Leon, and 10 miles from the port of Corinto on the Pacific, with which and with Managua it is connected by rail. It is a place of considerable trade. Pop. about 11,000.

Chinch, the popular name of certain fetid American insects of the family *Lygaeidae*, genus *Rhyparochromus*, resembling the bed-bug, very destructive to wheat, maize, etc., in the southern and western States. The name is also applied to the common bed-bug (*Cimex lectularius*).

Chincha (Chēn'chā) Islands, a group of small islands off the coast of Peru; lat. 13° 38' S.; lon. 76° 28' W. They are granitic, arid, and destitute of vegetation, and the coasts bold and difficult of access. Immense deposits of guano used to exist here, but after being exported for 34 years the supply became exhausted in 1874.

Chinchaycocha, chēn-chī-kō'chā, a lake of Peru, in the department of Junin, 13,330 feet above the level of the sea; 36 miles long and 7 broad, with an area of about 300 square miles. It is the source of the river Jauga, and abounds in fish and wild fowl.

Chinchilla, chīn-chēl'yā, Spain, a city in Murcia, in the province of Albacete, 10 miles southeast of the city of that name; situated on a rocky eminence. It is surrounded by a wall and commanded by a castle. Its handsome parish church has three naves, and a lofty tower containing six bells; the interior is richly decorated and contains pictures and other works of art. Quarries of granite, alabaster, gypsum, and limestone are wrought in the vicinity. Pop. 6,500.

Chinchilla, chīn-chī'l'la, a genus of South American herbivorous rodents allied to the cavies, which they resemble in the general shape of the body, in the limbs being longer behind than before, in the conformation of the rootless molars, and by the nature of the fur, which is more woolly than silky. *C. lanigera*, the only species, is about 15 inches long from the muzzle to the tip of the tail, and is covered with a beautiful pearly-gray fur, which is highly

CHINCHOLLE — CHINESE ARCHITECTURE AND ART

esteemed as stuff for muffs, pelisses, linings, etc. The chinchilla lives gregariously in the mountains of western South America, and makes numerous and very deep burrows. It is gentle and sportive, loses none of its gaiety in captivity, and is very cleanly. This genus gives its name to the family *Chinchillidæ*, which contains two other genera, one (*Lagidium*), including a large chinchilla-like rodent of the Andes; and the other (*Lagostomus*), containing that large numerous burrower of the pampas called vizcacha (q.v.).

Chincholle, shǎn shōl, **Charles Henri Hippolyte**, ip-pō-lēt, French novelist: b. Chauny, France, 16 July 1845; d. Paris 21 Aug. 1902. In the earlier portion of his career he was secretary to the elder Dumas, with whom he occasionally collaborated, and from 1872 was a member of the staff of 'Figaro.' He was an extremely versatile writer, but his style is wanting in finish. Beside his one-act farce, 'Oncle Margotin,' which ran 300 nights in 1870, and 'Le Mari de Jeanne' and other plays, his romances and other works include 'La Plume au Vent' (1865); 'Alexandre Dumas Aujourd'hui' (1867); 'Les Pensées de tout le Monde' (1868); 'Dans l'Ombre' (1871); 'Le Lendemain de l'Amour' (1880); 'Le Catalogue de l'Amour' (1881); 'Paula, Histoire d'une Neurosée' (1882); 'La Ceinture de las Survivants de la Commune' (1884); 'Le Vieux Général' (1886); 'Femmes et Pois' (1886); 'La Grande Prêtresse' (1887); 'Biographe du Général Boulanger' (1889).

Chinchon, chēn-chōn', Spain, a town 25 miles southeast of Madrid. After a Countess of Chinchon, wife of the governor of Peru in 1638.

Peruvian bark was named "chinchona," now habitually misspelled "cinchona."

Chinde, Africa, a town on the only navigable mouth of the Zambezi. Here the inland steamers meet the ocean steamers of various European companies; and here, too, Great Britain has obtained from Portugal a small piece of land called the "British Concession," for commercial purposes, and a residential district called the "Extra Concession."

Chinese Arrowroot. See NELUMBIVM.

Chinese Architecture and Art. The fine arts in China are as varied in character and as rich and tasteful in design as those of the peoples most successful in art; but they are known to Europeans in a very unequal fashion. Thus the architecture of the vast country, contained in the old provinces of China, as large as the United States west of the 100th parallel, and as diversified in soil and climate, is so little known that the essays on the art written even by former residents in China deal obviously with certain very limited places only—the neighborhood of a certain city, the borders of a certain river, and the like—and are, moreover, the studies of men not conversant with the construction or with the decorative buildings of any part of the world. The history of this architecture is yet to be written. The photographs now obtainable, having been made during the years since 1890, open up a new world of architectural art. It is enough to say here that there exist two systems of building; the one being a framed construction, usually of wood and capable of

great elaboration, the other a solid masonry construction carried out in brick or stone according to the resources of the neighborhood and the cost of the building. The framed system of building is closely akin to that used in Japan; and it is there that we can best study the wooden temple-tower and the wood-framed hall of reception. As for the masonry buildings, they are often large and massive, as is well known to all who have observed the walls and gateways of the great fortified cities and the famous "Great Wall" which protected Peking and its neighborhood from northern invasion. In the way of more decorative buildings less is known of the system of design, but several peculiarities may be mentioned. Thus there is a marked preference for the octagonal form in towers, and everywhere throughout the central provinces these buildings, called by the Europeans pagodas, rise above the hills and show over the groups of houses. The often cited use of the polygonal arch, that is, one with the intrados at least many-sided instead of curved, is to be noted as indicating how much that is attractive we have still to discover. The decorative gateways (pailoo) corresponding nearly to the *torii* of Japan and to those edifices called *toran* in the peninsula of India, are often admirable designs in the way of purely decorative architecture, monumental architecture, having no direct utility. The dwellings of the Chinese, even the palaces of the princes, do not seem to include many-storied and ponderous structures, but cover immense tracts of ground with gardens, among which stand buildings of no great height, but of a singular beauty of construction, especially in the roofs, and very richly decorated within. The dwelling-houses of the people are generally walled with brick and are not striking in their external appearance. The roof is an especial feature in Chinese art. It is commonly built with a hollow upward curve, the result of a very interesting system of construction, with light wood-work. This slightly concave surface covered with glazed ridge-and-furrow tiles richly colored, is an important feature in Chinese architectural composition. Painting in strong pure colors is a recognized element of external design; and it has been truly said that the special and distinguishing feature of Chinese exteriors is gaiety. Even the slightly-built one-story shops of the great towns are bright with vermilion and green; and the signs, painted with the very ornamental Chinese ideographs, help in this effect.

Chinese painting reached a great development as early as the 8th century A.D.; and there is every probability that it had then been a great school for several centuries. Landscape was one of its especially favored branches. While in Europe no one dreamed of landscape art for its own sake, the Chinese impressionist designers were producing admirable studies, both in color and in monochrome. Some few of these are in European museums, their authors and dates having been fixed by careful comparison, but the much more modern Japanese landscapes, in painting, monochrome, and wood-cut, are the best material from which to gain a general idea of that ancient landscape art. A highly religious art was developed in the 12th century A.D. At that time Buddhist religious feeling was strongly expressed in the art of some painters, while others affected rather a kind of decorative realism, that

CHINESE BIBLE — CHINESE IMMIGRATION

is to say, a close observation of natural objects used to inspire and to influence a highly decorative system of design. These paintings have been little known to Europe, because they are preserved in temples and almost inaccessible palaces; and again it is Japan which has opened to us, through her own art, a knowledge of the older arts of China. A few ancient paintings known to Europeans are of surprising interest; and they open up to us a whole system of design in form and color on the flat surface, which the West is now studying, much to its own advantage. The paintings best known to us are of some purely decorative character, those on porcelain having attracted the attention of Europe ever since the 16th century. These paintings are closely connected with the system of inlay which in the form of cloisonné enamel (see ENAMEL) is another of the great art industries of China. The porcelains affect a more close and careful study of the natural forms in flowers, trees, costume of figures and the like, whereas the enamels are more severe and are confined more closely to the making of admirable patterns; but the two systems differ only as one and the same artist might change his style according to the material and the demands upon him. A similar method of decoration by the free use of natural forms, conventionalized but still retaining much of their character, is seen in the splendid embroideries which have been little known to the West until within a few years. The textile fabrics of China — silks, brocades and velvets — have been known to collectors for many years, but very few national museums have provided themselves with any number of them: they present an inexhaustible treasure of beautiful design in strong and positive colors. It may be stated here that brilliant color is a specialty of the Chinese artist. Where, as in a fine cloisonné enamel, a Japanese artist works in dark and sombre colors, the Chinese will use a sky-blue ground, upon which an elaborate pattern is carried out in deep ultra-marine blue, violet, reddish-gray, dark green, apple green, vermilion, bright yellow, and white, with dividing lines of gilded metal, and many passages of gradation from one color to another. No people have equaled the Chinese in the decorative use of bright, pure colors.

Sculpture in the sense of a grand and permanent art of form is less the business of the Asiatic artist than painting, or than decoration properly so-called. Sculpture in the form of carving in ivory and wood and bronze figures of small size, has always attracted great attention in China and has reached an extraordinary state of excellence in spirit, movement, and skilful composition. Thus, a bronze figure will express perfectly the character and the sentiment of the occasion, while yet losing nothing of its sculptural value; and a group of "The Seven Wise Men" seated around the trunk of a bamboo will be rendered in cheap glazed pottery or in minutely carved ivory with equal skill and at a price proportionate to the labor expended and the prime cost of the material.

The ivory group may have cost, when new, a hundred times as much as the piece molded in clay, fired and then glazed and painted, but it is not on that account a finer design, the characters are not more perfectly expressed nor the attitudes of the figures more forcible or

more harmonious with each other. This is a great evidence of an old traditional skill of sculpture excelling in the larger as well as in the smaller scale of work. Relief sculptures, especially those in wood, in soft stone and in the surface of lacquer, which has generally a wooden background prepared to receive the impressed and sculptured coat of the viscous material, are as effective for their decorative purpose as are the sculptures in the round. Finally there must be mentioned the lapidary's art, in which the Chinese have always excelled, for the most marvellous carvings in agate, jade and rock crystal, that is to say, in the hardest materials known, are unmatched in the world, and they are as artistically perfect as the carvings in the softer stones; their essential characteristics perfectly understood and always observed. The conventional way of rendering in hard material the most delicate leafage and sprays of twig and blossom is perfectly maintained; and the brilliant polish which is one of the beauties of these carvings is carried through beneath those delicate undercut sprays.

RUSSELL STURGIS,

Author of 'Dictionary of Architecture.'

Chinese Bible, The, a work compiled and partly composed by Confucius, divided into five books:

1. Called the 'Yih-King,' a treatise on cosmogony.
2. Called the 'Shu-King,' the acts and maxims of Yaou, Shun, and other ancient kings held in religious veneration.
3. Called the 'Shi-King,' which contains 311 sacred poems.
4. Called the 'Ee-King,' or book of rites, containing maxims and directions for everyday life and all conditions of men.
5. Called the 'Chun-t sien,' a history of Confucius' own times.

Chinese Cæsar, The, Kao-hoangti, founder of the Han dynasty, one of the most illustrious that ever occupied the Chinese throne. Dynasty lasted 202 B.C.—226 A.D.

Chinese Empire. See CHINA.

Chinese-fire, a pyrotechnic composition, consisting of gunpowder, 16; niter, 8; charcoal, 3; sulphur, 3; cast-iron borings (small), 10.

Chinese Glue, a superior glue and varnish, obtained from a species of *Alga* which abounds on the shores of China. When once dried it resists the action of water, and is used by the Chinese to fill up the lozenge-shaped interstices in the network of bamboos, of which their windows are frequently constructed, as well as to strengthen and varnish the paper of their lanterns.

Chinese Gordon. See GORDON, CHARLES GEORGE.

Chinese Grass, China Grass, Rhea or Ramie Fibre. See RAMIE.

Chinese Hemp. See CORCHORUS.

Chinese Immigration. Until the California gold discoveries of 1848 there were literally no Chinese laborers in the United States; nor was there then, or for years afterward, the least prejudice against their coming — the one objection to the Chinese being that they kept foreigners out of their own country, not that they infested others. From 1840 to 1850, according

CHINESE ART.



1. Enameled copper plate. 2. Porcelain vase (Siwen-te, 1426-1436). 3. Painted screen. 4. Porcelain vase (Ming, 1368-1644). 5. Snuff-jar of green paste. 6. The War-God, Kwan-ti, in porcelain. 7. Tea-pot of terra-cotta. 8. Embroidered altar-cloth. 9. Silk embroidery. 10. Hair-pin.

CHINESE IMMIGRATION

to the records of immigration, only 35 came over, and those all in the year from June 1849 to June 1850. The treaties of 1844 and 1858 with China expressly aimed at securing a freer interchange both of commodities and citizens. The current "buncombe," even in California (the surest indication of public feeling, because its one aim is to please the unreflecting) was to proclaim America the asylum for the poor and oppressed without exception; and San Francisco business men welcomed the early Chinese comers, publicly fraternized with their traders, and made speeches of mutual compliment, with no objection from any source. During the next decade 1850-60, 41,397 Chinese came to the port of San Francisco, of whom about 6,500 returned to China, leaving the net Chinese population in 1860 34,933, nearly all in California. For some years the general feeling continued to be favorable, as labor was dear and domestic service almost impossible to obtain; and the Chinese laborer, and above all, the Chinese house servant, seemed to make industrial progress and lives of refined leisure possible. In the latter half of the decade some uneasiness began to be felt, but mainly from the belief that Chinese criminals were being deported here. The first restrictive legislation, not specifying Chinese, was to prohibit this. In 1855 an act was passed, said to have been aimed against the Chinese, fining any shipmaster \$50 who landed passengers incapable of becoming citizens of California under its Constitution and laws, and ordering commissioners of immigration to obtain certificates of identity; but this, too, must have referred to criminals alone, for there was at this time no bar to Chinese citizenship. In 1858 the Reed Treaty was negotiated, after the Chinese war of that year, and no restriction was placed on immigration. In 1862 the California legislature appointed an investigating committee on the subject; but it was still felt to be only a local nuisance, not calling for any hasty or severe measures. Even as late as 1868 the Burlingame Treaty with China, though reprobating enforced immigration (coolies under contract), asserted the right of migration to be inherent in the human race; and on 27 July 1868, a special resolution of Congress, in response to anti-immigration measures in the East, repeated this assertion as to the right of human beings to expatriate themselves, and declared that its restriction was contrary to the fundamental principles of the republic. This meant European immigration, and caused a painful "straddle" in later political campaigns when California votes were needed; but it proves that even then the Chinese question had not become acute enough locally to force California politicians into making it a national touchstone. Within a few years after this, however, it was not only the burning issue of the Pacific Slope, but had emerged into the national arena. Bret Harte's 'Heathen Chinee' shows that "Chinese cheap labor" had become a popular local catchword; and the attempt of Eastern manufacturers about this time to use the Chinese for strike-breakers made the question of national notoriety.

This hostility was partly due to the Chinese as such—as extreme aliens with social and religious customs marking a permanent separation; but mainly to the special character of the immigration. Except a few merchants, it consisted almost wholly of the lowest class of coolies

about Canton, and it was firmly believed that it was not voluntary and self-selected immigration, like that from Europe, but a system of exploited serfage—the coolies being collected in gangs by a Chinese corporation called the Six Companies, and shipped under rigid contract to work for a period of years under terms fixed by their masters. Their low standard of comfort was believed to affect the market and wage-rate for white labor unfavorably, and to build up great corporations without building up a corresponding class of civilized citizens; their sections of the cities were plague-spots of overcrowding and filth, besides being Alsatias where law did not run; they brought no wives, intending no permanent residence, and supplied the places of wives with hundreds of imported Chinese prostitutes; and their iron-barred opium joints, tempting not Chinese alone, were a still greater danger. Lastly, those who saw the excessive strain placed on democratic institutions by ignorant European immigrants, ultimately assimilable, were appalled at the prospect of operating them among a huge unassimilable and purchasable brute-vote on the Pacific Slope. If they were made voters, they would force a permanent political division on the lines of race; and if not, would form a dangerous anomaly and nuisance in the republic. Thus, white industry, order, sanitation, public morals, and statesman-like forecast united in the conviction that this class of immigration must be prohibited or severely restrained. These valid objections and fears were reinforced by others, unsound or exaggerated. The numbers arriving were vastly swollen in popular imagination, and the departures suppressed; except that when a point was made of their worthlessness to the country, it was asserted that all returned to China and so "drained the country" of their wages—which, if true, of course nullified the permanent danger from them, and involved an economic fallacy. The actual number of Chinese in the United States in 1870 was 62,376, an increase of some 27,000 in 10 years; 69,298 had come over within 10 years, and 34,850, or over one half, had gone back. But it was generally stated at 150,000 to 175,000; and the rate of increase at fully 25,000 a year. The population of China was estimated at 400,000,000 (pure guesswork), and it was assumed that the immigration represented a tendency diffused through this entire mass, who could and probably would pour 100,000,000 of its people into America in a short time, and swamp the European element utterly. As a matter of fact, the entire immigration came from within 40 miles of Canton, and the mass of Chinese will not emigrate, even to countries where they have full civil rights. It may be mentioned that in such places as Java and Hong Kong, they live and die with the same permanency as others; so that the argument which rests at once on the danger of their remaining and the financial loss of their not remaining must lose the latter clause. It was also asserted that there were more Chinese males in California than voters; but in fact they were under one sixth. But after all deductions, it was certain that the Chinese population in no long time would form a grave and apparently insoluble problem, a social and political menace, on the Pacific coast, and that the State could better afford a slower industrial growth, than a rapid

CHINESE LANGUAGE — CHINESE SWALLOWS' NESTS

one based on a proletariat and a body almost equally dangerous as citizen or aliens.

After attempts at restriction by local legislation, which were invalidated by the federal courts as in violation of United States treaties, California appealed to Congress for a national law; but that body evaded the question till 1876. Then the exigencies of the Hayes-Tilden campaign compelled both parties to bid for California's electoral vote by anti-Chinese planks in their platforms; and Congress (the House, 6 July, the Senate 17 July), appointed a joint special committee to investigate the subject. It met at San Francisco 18 October, heard a mass of testimony, and made a very voluminous report, taking the strongest ground in favor of a restrictive law (Senate report 689, 44th Congress, second session, 27 Feb. 1877). At this time the Chinese population was about 100,000. Nevertheless, the party pledges were not redeemed in Congress till 1879, when on 20 March such a bill was passed; but it was vetoed by President Hayes as being in conflict with the Burlingame Treaty. In 1880 a commission was sent to Peking to negotiate a new treaty permitting the restriction. This treaty, signed 17 Nov. 1880, ratified by the Senate in March 1881, gave the United States the power to "regulate, limit, or suspend" the immigration of new Chinese laborers, but not to prohibit it altogether; permitted laborers already in the country to remain and travel to and from it at will; and allowed Chinese merchants, students, teachers, or travelers, to exercise their functions without molestation, each class to have all the privileges and advantages of the most favored nation. (The Chinese population here in 1880 was 105,465.) Under guise of giving effect to this treaty, Congress, in March 1882, passed an act suspending Chinese immigration altogether for 20 years. This was vetoed by President Arthur on the ground that so long a suspension was virtually absolute prohibition, and not in accord with the spirit of the treaty. On 6 May another bill was passed to meet this objection, suspending fresh immigration for 10 years, both of skilled and unskilled laborers, permitting those already here to remain, but forbidding their naturalization. The provisions of this act were minutely severe. The exempted Chinese must have certificates of identity issued by the Chinese government and vided by the United States consul or diplomatic representative at the port of departure; departing Chinese laborers must take out return certificates, with heavy penalties for forgery or false personation; a master of a vessel who landed any unauthorized Chinese was subject to fine and imprisonment and the confiscation of his vessel; no Chinese passengers could be landed until the collector of the port had received the lists of the passengers and compared them with the persons, etc. The only Chinese laborers who could be permitted to return after once departing were those who had a living wife, parent, or child here, or \$1,000 worth of property, which was made answerable for their default.

This was "amended" on 1 Oct. 1888 by the Scott Act, striking out all permission to return for any purpose, forbidding the issue of return certificates, and declaring all that were issued void,—in a word, absolutely barring America to any Chinese workman once outside it. A treaty

was at this time pending between the United States and China by which the Chinese government was to prohibit the emigration of laborers, and the United States was to protect those in the country from violence, which it had shamefully failed to, but the Scott Act enraged the former government, and it refused to ratify the treaty. It may be mentioned that the supreme court in 1883, October term, decided that Congress can abrogate a treaty. On the expiration of the 1882 act in 1892, the "Geary law" of 5 May, extended it for another 10 years, with further severities, not called for by any dangers at hand; chief of these, that any Chinaman found in this country unlawfully should be imprisoned for a year at hard labor. On 3 Nov. 1893, on complaint that Chinese are so much alike to Western eyes that certificates of identification are not sufficient, an act was passed that each certificate must include the holder's photograph in duplicate. On 7 Dec. 1894, a convention with China restored the conditions of return to the status of 1882. On 3 March 1901, it was enacted that a Chinaman can only be arrested under these acts on sworn complaint of certain specified United States officers. In 1902 the exclusion was re-enacted for another decade. With the general intent of these acts, there is little difficulty in concurring; but some of the provisions, and the petty acridity of their execution, exhibit a spirit of panic which is neither dignified nor sensible. The volume of the immigration is the very essence of the danger; if it is insignificant it is harmless. Hence, the groundless harrying of innocent travelers or students, as if the mere presence of a single Chinaman constituted a grave national danger, is unmanly and irrational. The Chinese population in 1890 was 107,488; in 1900, 89,863—a falling off of nearly 20,000 in 10 years. Consult: George F. Seward, 'Chinese Immigration' (1881); Mayo Smith, 'Emigration and Immigration' (1895); and the congressional report above cited.

Chinese Language, Literature and Writing. See CHINA.

Chinese Lantern, a lantern made of thin paper, usually variously colored and much used in illuminations.

Chinese Olive, the fruit of *Canarium commune*, order *Amyridaceæ*, a tree of the Asiatic archipelago yielding an oil which is used as a condiment and for lamps.

Chinese Pavilion, a semi-musical instrument composed of a pole with several transverse brass plates of some crescent or fantastic form, generally terminating at top with a conical pavilion or hat. On all these parts are hung small bells, which the performer causes to jingle by shaking the instrument held vertically up and down. It is employed only in military bands, and is more for show than use.

Chinese Swallows' Nests, curious productions, which sell at a high price in China, though they have no special points of recommendation beyond many other gelatinous ingredients in soups. They were formerly supposed to be made of some species of the rose-spored *Algæ*, as *Sphærococcus lichenoides*; but this is now ascertained to be a mistake, and it is known that they are formed of dried saliva from the mouth of the bird itself. The nests are the production of certain

CHINESE TARTARY — CHINOOK WIND

species of swifts (not swallows) of the genus *Callocalia* which breed in caves on islands of the tropical Pacific and Indian oceans. All species of swifts secrete an abundant mucous saliva which is utilized along with other materials in constructing the nests; but species of *Callocalia* only form their nests of saliva exclusively.

Chinese Tartary, an old name of Eastern or Chinese Turkestan.

Chinese Terms. See CHINA.

Chinese White, a pigment prepared from the white oxide of zinc (ZnO), introduced into the arts in the latter part of the 18th century as a substitute for the preparations of white lead. Its color is not changed by exposure to the air.

Chinese Windlass, a differential windlass, in which the cord winds off one part of the barrel and on to the other, the amount of absolute lift being governed by the difference in the diameters of the respective portions. It is a good contrivance in the respect that great power may be attained without making the axle so small as to be too weak for its work.

Ching, Chinese prince: b. Peking about 1840. He is related to the Chinese imperial family and has held important civil and military posts, although he boasts that he has never been outside of Peking. He was at the head of the Tsung-li-Yamen, but was deposed in 1900 for his efforts to protect the legations in Peking, during which he attacked the Boxers (q.v.).

Ching-Hai, chīng'-hī', or **Chin-Hai**, China, a seaport in the province of Che-Kiang, about 11 miles from Ningpo. Ching-Hai has no foreign commerce of its own, not being a treaty port; but is a resort for native traders from the Chusan Archipelago, and from here Chinese merchandise is sent to Ningpo. There is a missionary station and a native academy for students who compete in the civil service examinations at Ningpo. Pop. (1900) estimated 150,000, mostly Chinese.

Ching-Tu, chīng-too', China, city, capital of the province of Sze-Chuen, situated on the Min River, 150 miles from its junction with the Yang-tse-Kiang, and 175 miles from the treaty port Chung-King. Ching-Tu is in one of the largest fertile plains of China, and is surrounded by mountains rich in the minerals of commerce. By way of the Min River and canals nearby, trade is carried on with the places in the valley of the Yang-tse-Kiang. The walls around the city are 12 miles in extent. The houses and streets indicate wealth. Telegraphic communications have been established with Hankow. It has an arsenal with modern equipment, and goods of European manufacture are found in some shops. Pop. about 9,000,000.

Chingleput, chīng-glě-pūt', or **Chengalpat**, or **The Jaghire**, India, a coast district in the province of Madras, area 2,842 square miles, surface rocky, water scarce, crops scanty. In the fertile localities grain and fruits are raised which are shipped to the Madras markets. Some manufacturing of cloth is carried on. The chief towns are Conjeveram, St. Thomas'

Mount, Saidapet, Tiruvotiyur, and Chingleput. This tract of country was obtained in 1760 and 1763, by the East India Company, from the Nabob of Arcot. It was invaded by Hyder Ali in 1768, and again in 1780, when it was nearly depopulated by famine and emigration. Pop. 1,136,928.

Chingleput, or **Chingalpat**, India, town in the district of the same name, 15 miles west from the Bay of Bengal, 35 miles southwest of Madras, situated in a valley surrounded by hills. In 1751 it was taken by the French, retaken the following year by the British under Clive. A railroad enters the town. It has Roman Catholic and Protestant missions, hospital, jail, civil and criminal courts, and a dilapidated fortress which at one time was of considerable extent and well fortified. Pop. 7,000.

Chin'iot, India, town in the Jhang district of the Punjab, near the Chenab. It is famed for wood-carving, and has manufactures of coarse cloth. Its trade is also of considerable importance. Pop. 13,476.

Chiniquy, shē-nē-kē, **Charles Paschal Telesphore**, Canadian clergyman: b. Kamouraska, Que., 30 July 1809; d. Montreal 16 Jan. 1899. He was a Roman Catholic priest from 1833 to 1858, when he abandoned the Roman Catholic and joined the Canadian Presbyterian Church. He lectured in England in 1860, 1874, and 1882, and in Australia 1878-80. He wrote 'The Priest, the Woman, and the Confessional' (1874), a work that has had an enormous circulation in English-speaking countries, and has been translated into French, Italian, Spanish, and Dutch; 'Fifty Years in the Church of Rome' (1886; 5th ed. 1886); 'Papal Idolatry: Exposure of the Doctrine of Transubstantiation' (1887).

Chinkara, the common gazelle of India, sometimes called the "ravine deer." See GAZELLE.

Chinoline, kīn'ō līn. See QUINOLINE.

Chinon, shē-nôn', France, an antique town in the department of Indre-et-Loire, beautifully situated on the Vienne, 31 miles southwest of Tours. Crowning a lofty rock are the ruins of its vast old castle, the French Windsor of the Plantagenets, the death-place of Henry II., and later the residence of several French sovereigns, where, in 1429, Joan of Arc revealed her mission to the Dauphin. A farmhouse across the Vienne is pointed out as Rabelais' birthplace. Pop. (1901) 4,200.

Chinook (chī-nūk') **Wind**, a warm dry wind that often blows from the Rocky Mountains over the plains that stretch from their eastern base. The moisture-laden winds from the Pacific Ocean striking the lofty barriers of the Cascade and Rocky Mountains are forced to precipitate their moisture as rain and snow. When the ranges are crossed the winds are cold and dry. Descending the eastern slopes of the mountains the winds become warmer, because in descending the air is condensed, the atmospheric pressure at the base of the mountains being much greater than at the summit. The winds are, however, still dry, all their moisture having been precipitated in crossing the mountains. In the de-

CHINOOKS — CHIOS

scent of 10,000 feet or so to the plains of Montana and the prairie province of Canada, the winds become so warmed by the increased pressure that they give a mild climate to regions far north. It is on account of these winds that cattle on the prairies of Alberta can graze in the fields all winter, a snowfall of a foot or more disappearing in a few hours before the warm, dry breath of the Chinook. Not all the warm winds of Montana and the regions north and south have their origin west of the Rockies. Various causes contribute to the formation of descending air, and when the descent is a number of thousands of feet, the winds resulting are always warm. Such winds blow over prairie regions west of the Missouri, but not always adjacent to the Rockies. Similar warm winds are known in other parts of the world, as in Switzerland, where they are called Föhn winds.

Chinooks, *chī-nūks'*, a tribe of Indians, now nearly extinct, on the Columbia River, or in Oregon. Their language is very difficult to learn and to pronounce, and this led to the formation of the Chinook jargon, a trader's *lingua Franca*, consisting of words from French, English, and Hawaiian, as well as from Chinook and other Indian tongues.

Chinquapin, *ching'ka-pīn*, a dwarf chestnut (*Castanea pumila*), a native of South America, but growing wild in the Southern States as far north as Pennsylvania and westward as far as Texas. It is a shrub four or five feet high, but sometimes grows to the height of 30 or 40 feet.

Chins, a savage tribe living in the mountainous region between Lower Bengal and Upper Burma, of very primitive habits.

Chinsura, *chīn-soorä*, British India, a town beautifully situated on the Hugli, and now included in the town of Hugli, 20 miles north of Calcutta. It is a military station, was formerly a Dutch settlement, and contains many neat houses in the Dutch style. It is celebrated for the manufacture of cheroots, and has several schools, among them some belonging to the Free Church of Scotland.

Chintreul, Antoine, *än twän shän-trél*, French landscape painter: b. Pont-de-Vaux, France, 15 May 1816; d. Septeuil 13 Aug. 1873. He was a pupil of Corot, obtained a medal at the Paris Exhibition, 1867, and that of the Legion of Honor in 1870. His sunlight effects have been greatly admired. The Luxembourg Gallery contains his 'Thicket With Deer' (1873).

Chintz, a cotton cloth gaily printed with designs of flowers, etc., in five or six different colors. It was a favorite in the time of Queen Anne, long before cotton prints became cheap. The name, being highly respectable, has since been applied to goods lacking the graceful and artistic character of the genuine article. The Chintzes of the Coromandel coast were celebrated in the time of Marco Polo, 13th century. They are mentioned also by Odoardo Barbosa, a Portuguese, who visited India soon after the passage of the Cape of Good Hope by Vasco de Gama: "Great quantities of cotton cloths admirably painted, also some white and some striped, are held in the highest estimation."

Chio, *kē'ō*. See CHIOS.

Chiob'be, a town in China, province Fokien, 15 miles southwest of Amoy. It is situated on a river bearing different names, navigable by junks of 400 tons, and is defended by a citadel and numerous other fortifications. It is the great emporium for common china-ware, and has important fisheries. The rearing of silk-worms forms an important occupation. Pop. estimated, 300,000.

Chiococca, *kī-ō-kök'a*, a genus of tropical plants of the natural order *Rubiaceæ*, consisting of small, often climbing, shrubs, with opposite stipulate leaves and bell-shaped or funnel-shaped, yellowish flowers in axillary clusters. The fruit is a white berry with two seeds. The bark of the root of *C. anguifuga* is a violent emetic and purgative. The root of *C. densifolia*, a woody bush, is considered a remedy for snake bites by the people of Brazil.

Chioggia, *kē-ōd'-jä*, or **Chiozza**, an important seaport town of northern Italy, 15 miles southwest of Venice, on an island at the southern end of the Venetian Lagoon, connected with the mainland by a stone bridge of 43 arches. It is founded on piles, has a beautiful cathedral; its harbor, the deepest in the lagoon, is guarded by forts and batteries. It is one of the strongest places in the Venetian lagoons. Many of the people are engaged in the coasting trade, lace-making, weaving, ship-building, and fishing. Pop. 25,100.

Chione, *kī-ō'nē*, the daughter of Dædalion, who was killed by Diana for boasting of her beauty.

Chios, *kī'ös* (now called by the natives *Chio*, Italianized into *Scio*), one of the most beautiful and fertile islands in the Ægean Sea, belonging to Turkey, seven miles off the coast of Asia Minor, at the entrance to the Gulf of Smyrna; about 30 miles long from north to south, by 8 to 15 miles broad, with a coastline of about 110 miles, an area of 320 square miles, and a population of about 70,000, almost all Greeks. The northern part is more mountainous than the southern part. The climate is delightful. Earthquakes are common, and one in 1881 caused the death of 3,558 persons, and the destruction of property to the value of over \$15,000,000. The wine produced on the northwest coast, the *Vinum Arvisium* of ancient times, is still esteemed. Other products are figs, also noted in classical days; mastic, silk, lemons, oranges, and olives. Goats' skins are also exported. The capital, Chios, about the middle of the east coast, contains about 13,000 inhabitants, and has a harbor touched by various services of steamers, and doing a good trade. On the west coast is a rich monastery, Nea-Moni, founded in the 11th century. In ancient times excellent marble and potter's clay were quarried in the mountains, and recently pits of antimony and ochre have been worked.

Chios is one of the places which contended for the honor of giving birth to Homer. It formed in early times one of the most flourishing of the Ionian states, and contributed 100 ships to the Greek force defeated by the Persians in the sea-fight off Miletus (494 B.C.).



Photograph by J. Horace McFarland Co.

CHINQUAPIN.

CHIPMAN — CHIPPAWA

After the Persian victory the town and temples of Chios were burnt and many of the people enslaved. In more recent times the island was taken by the Genoese (1346), and by the Turks (1566), in whose hands it has since remained, except for a short interval. It was conferred as a private property on the sultana. After a long period of prosperity, Chios suffered a terrible blow during the war of Greek independence. A number of the Chioters having in 1821 joined the revolted Samians, a Turkish fleet and army, in 1822, inflicted dreadful vengeance; 25,000 Chioters fell by the sword, 47,000 were sold into slavery, and only some 5,000 escaped. A second rising in 1827 was likewise unsuccessful. The island has since been prospering.

Chip'man, Nathaniel, American jurist: b. Salisbury, Conn., 15 Nov. 1752; d. Middlebury, Vt., 15 Feb. 1843. He was an officer in the American army for a part of the Revolutionary War, and was admitted to the bar in 1779. He then removed to Tinmouth, Vt., where he commenced practice, and served as State's attorney for four years. In 1786 he was elected assistant judge of the supreme court, being the first lawyer who had been placed upon the bench in Vermont. In 1789 he was elected chief justice, and held that office until October 1791. In 1789 he was also appointed one of the commissioners to adjust the differences between Vermont and New York. In 1791 he was a member of the convention called to decide the question whether Vermont should accede to the Union. On 18 Jan. 1791 he was appointed a joint commissioner with Lewis R. Morris to attend Congress and negotiate for the admission of Vermont into the Union. In 1793 he published a small work entitled 'Sketches of the Principles of Government,' and a volume of 'Reports and Dissertations.' In 1796 he was again elected chief justice of the supreme court. In 1796 he was appointed one of a committee to revise a code of statute laws for Vermont, and the revised laws of 1797 were written by him. He was a United States senator in 1798-1803. In 1813 he was again elected chief justice of the supreme court, and continued in office two years. From 1816 to 1843 he was professor of law in Middlebury College. In 1833 he published 'Principles of Government: a Treatise on Free Institutions, Including the Constitution of the United States,' containing portions of his former treatise.

Chip'man, Ward, Canadian jurist: b. St. John, New Brunswick, 10 July 1787; d. there 26 Dec. 1851. He was the son of Ward Chipman (1754-1824), a Massachusetts loyalist who went to New Brunswick after the American Revolution. He graduated at Harvard in 1805, and succeeded his father as agent for the crown in determining the northwest angle of Nova Scotia. After holding minor legal offices he became puisne judge of the supreme court 1825, and chief justice of New Brunswick 1834, president of the legislative council, and speaker of the assembly.

Chip'munk, an American ground-squirrel, a small animal of the genus *Tamias*, about six inches long, with a slender furred tail, nearly

as long as its body, and a coat of reddish-brown fur, striped with white on the back; from the marking it is called *Tamias striatus*. The eastern species has two white stripes, and the western chipmunk, *Tamias quadrivittatus*, which is exceedingly common all over the Rocky Mountain region, bears four stripes. The ground color also is extremely variable according to habitat. This little creature is often found frisking along stone walls, stopping now and again to sit erect and dart sharp glances at moving objects. It is generally shy in the presence of man, and escapes with great rapidity, when need arises, into some hiding-place. Its home is a burrow in some woodland place, tunnel-like in structure, sometimes fully 20 feet long, and always deep enough to be below the frost-line. It is enlarged into chambers at intervals. One of these, supplied with dried leaves, grass, and like material for bedding, is the sleeping apartment; the others are store-houses. In them the chipmunk stores his winter supplies of small nuts and acorns, especially the sweet beech-nuts. These he carries home, often several at a time, in his distensible cheek pouches. They are his chief food; but he will eat, also, buds, mushrooms, and insects. The breeding season is in May; and the young are usually from four to six in number. The chief enemies of the chipmunk are the fox and the weasel. The former is dangerous only in the open, as he is too large to disturb the chipmunk at home. But the weasel can attack him in his burrow; and, to escape him, the chipmunk makes an opening for possible escape, at the far end of his burrow. For consideration of the various species of *Tamias*, consult J. A. Allen, 'Bulletin of the American Museum of Natural History,' Vol. III.

Chippawa, *chīp'a wā*, Canada, a village in the province of Ontario. It is situated at the confluence of the Chippawa and Niagara rivers, two miles above the Falls, and contains an extensive steam-engine manufactory, and one of the largest factories of stoves in the province. On 5 July 1814 the battle of Chippawa (q.v.) was fought here between the Americans and the British.

Chippawa, Battle of, 5 July 1814, an action in the War of 1812, remarkable for the defeat of a force of British regulars by an inferior number of Americans, in pitched battle on an open plain, without advantage of position, and with weaker artillery. Maj.-Gen. Riall, commanding the British forces, had about 1,500 line infantry—the King's regiment, the 100th, and the Royal Scots, with dragoons and artillerymen, and 600 skirmishers—north of the Chippawa River, which enters Niagara on the Canada side just above the rapids; the bridge from Chippawa village crossed it near its mouth. Joseph Brown's American force lay to the south beyond Streeter's Creek, and Brown started on the morning of the 5th to build another bridge across the Chippawa, to outflank Riall, whose skirmishers crossed the river and harassed the work and the camp from the woods on the west, and Peter B. Porter's militia brigade was sent to drive them out. As it approached the river, Riall's army

CHIPPENDALE — CHIQUINQUIRA

crossed the bridge on its right flank, and it fled in panic, about 5 p.m. Riall thereupon deployed his force and advanced on the plain toward Brown. Scott's brigade of 1,300 was about crossing the creek bridge for a Fourth of July parade and, the creek being lined with woods, only learned of the danger at the last moment. Each side had three guns; but the British were two 24's and a 5½-inch howitzer, against the American three 12's. Scott's troops crossed the bridge under fire from the 24's, and coolly deployed beyond; while Scott threw his wings forward to avoid being out-flanked, the left wing reaching into the woods. Both sides advanced, with pauses to load and fire, till the flanks touched and the centres were 200 feet off; when the British, unable to endure the deadly musket-fire in front and the artillery now sweeping diagonally through the ranks, broke and ran for the Chippawa. The battle lasted less than an hour; and when Ripley's brigade came to Scott's help the plain was deserted by the enemy. Riall lost 137 killed and 305 wounded of the regulars, nearly a third of his entire force, besides 73 skirmishers; Scott, 48 killed and 227 wounded; and Porter, 22 more. The victory was won by superior musketry and artillery fire, as shown by the enormous disparity in killed; and by a leader under whom every private was a hero. Consult Henry Adams, 'History of the United States,' Vol. VIII., ch. 2.

Chip'pendale, Thomas, English cabinet-maker. He is supposed to have gone to London from Worcestershire before 1750. The style of furniture named from him was less heavy and severe than that of his successors, and was elaborate, delicate, and baroque, with classical tendencies. He wrote a 'Cabinet-maker's Director' (1752).

Chip'penham, England, a municipal borough of Wiltshire, 12½ miles northeast of Bath, on the Avon, here crossed by an ancient stone bridge of 22 arches. It consists of one principal street, with others diverging from it. It contains two large parish churches with lofty spires, an old and a new town-hall, etc. The station of the Great Western Railway here is a very large one. The town is an important mart for cheese, and contains a woolen factory, a silk factory, large condensed-milk factory, railway works, boot factories, etc. Pop. (1901) 5,074.

Chippewa, chīp'pē-wā. 1. Michigan, an eastern county of the upper peninsula, bordering on lakes Superior and Huron, and bounded east by the river St. Mary. The surface is hilly and partly covered with forests of pine. Capital, Sault Ste. Marie. 2. Wisconsin, a county in the northwestern about 50 miles from the Mississippi River, traversed by the Chippewa and several affluents; area, about 4,300 square miles. Sandstone is abundant, and much of the surface is well wooded. Capital, Chippewa Falls.

Chippewa, a river of Wisconsin, which has its rise in the north of the State, and after receiving several tributaries flows southwest into Lake Pepin, an expansion of the Mississippi.

Chippewa Falls, Wis., town and county-seat of Chippewa County. It is on the Chippewa River, and the Chicago, M. & St. P., the Chicago, St. P., Minneapolis & O., and the Wiscon-

sin Cent. R.R.'s; 12 miles northeast of Eau Claire. It contains the County Insane Asylum, the State Home for the Feeble-Minded, and has important manufactures, large water power from the river, electric lights, and street railways, daily and weekly newspapers, two national banks, and an assessed property valuation of \$2,000,000. Pop. (1900) 8,094.

Chippeways, chīp'pē-wāz, or **Ojibways**, a tribe of North American Indians in the United States and Canada. They are distributed in bands round both sides of the basin of Lake Superior, where they once owned vast tracts. They are of the Algonquin stock, tall, active, and well formed, subsist chiefly by hunting and fishing, and number about 18,000.

Chip'ping Spar'row (*Spizella socialis*), a common North American migratory bird allied to the chaffinch, some five or six inches long, whose song consists of about half a dozen notes uttered in quick succession. It is also called chipping bird, and chippy. It is also known as the hair-bird from its habit of lining its nest with horse-hair. In the nest, which is built in low trees or shrubs, are laid four or five blue eggs slightly speckled with brown. Two or three broods are raised during the season. The bird is naturally an eater of seeds, and has sometimes been known to destroy insects, but the evidence in favor of the contention that it is the friend of the farmer and gardener is hardly enough to warrant the encomiums of some writers.

Chips from a German Workshop, by F. Max Müller (5 vols). A collection of special studies incidental to the author's editing of a library of the 'Sacred Books of the East.' The several volumes cover various fields, as follows: (1) 'The Science of Religion'; (2) 'Mythology, Traditions, and Customs'; (3) 'Literature, Biography, and Antiquities'; (4) 'Chiefly the Science of Language'; (5) 'Miscellaneous' and later topics. Although they are the result of "occasional work," their wealth of material and thoroughness of treatment, and the importance of the views presented, give them not only interest but permanent value. On many of the points treated, discussion is still open, and some of the views advanced by Prof. Müller may come into doubt; but his contributions to a great study will not soon lose their value.

Chiquichiqui (chē'kē-chē'kē) **Palm**, a native of Brazil, where it is called piassaba. It grows in swamps and along low river banks. Its leaves are used for thatching, and it is the source of a fibre which is used for making brushes.

Chiquimula, chē-kē-moo'lā, Guatemala, Central America, a small town in the east of Guatemala, 55 miles northeast of the city of New Guatemala. It is in a mountainous region, valuable mineral deposits near, and a delightful climate. Pop. 6,500.

Chiquinquirá, chē-kēn-kē-rā', Colombia, South America, the largest town in the department of Boyacá, near the Suarez, 42 miles west of Tunja; was an Indian place of pilgrimage before the conquest. In one of the churches is a miraculous picture of the Virgin. Where it is preserved is now visited annually by some 60,000 pilgrims. Pop. 12,800.

CHIQUITOS — CHIROPODY

Chiquitos, chē-kē'tōz, a race or stem of Indians inhabiting western Bolivia. The chief occupation of the people when first discovered by the whites, was agriculture. They rejected Spanish rule and European customs until 1691, when the Jesuits established a mission among them. The soil here is rich, growing vanilla, indigo, cotton, sugar, etc.; but for want of markets there is little cultivation. The policy of the Jesuit missionaries has made the Chiquito language the predominant one among the natives. It is copious, and is said to have a separate vocabulary for female use. The size and decorations of the churches, and the perfection of the church music in which the natives take a part, are a curious monument of the perseverance of the Jesuit missionaries, which has succeeded in implanting in the midst of these solitudes a fragment of European civilization. In the year 1767 the Jesuits were expelled from the place, by Spanish authority. Since then the Chiquitos have not prospered, and their numbers have decreased. They still cultivate the soil, which is fertile, growing vanilla, indigo, cotton, sugar, etc.; but for want of markets there is little ambition to raise large crops. The native population is about 22,000, distributed among 10 missions.

Chiretta, chī-rēt'ta. See CHIRATA.

Chiriqui, chē-rē-kē', Panama, formerly one of the administrative divisions of Colombia, adjoining Costa Rica; area, 6,500 square miles. It is well wooded, and has rich pasturage, especially on the Atlantic coast, where the climate is very moist. The Cordilleras that occupy the interior reach their highest point in the volcano of Chiriqui (11,265 feet). Chief town, David. On the north coast is a spacious lagoon with a depth of water for the largest ships. Pop. 45,000.

Chirogale, kī'rō-gāl, or MOUSE-LEMUR, a small lemur of the genus *Chirogale*, native exclusively to Madagascar, especially *C. Coquereli*. It lives in trees and at the approach of the dry season curls up in a hollow place in a tree and sleeps until the rainless time is over. Like hibernating animals of cold regions, it accumulates a large deposit of fat before becoming torpid; and when it wakes it has regained its normal condition. It feeds on fruits and insects, and builds a nest somewhat like a bird's. Four other species are known whose habits are similar, generally, to those of the lemurs (q.v.), especially the galagos, to which they are closely allied.

Chiromancy, kī'rō-mān-sī. See PALMISTRY.

Chiron, kī'rōn, in Greek mythology, the son of Kronos (Saturn) and Philyra. Kronos assumed the shape of a horse, in this amour, to deceive his wife, Rhea. The shape of Chiron, therefore, was half that of a man, half that of a horse. In point of fact, Chiron was one of the people called Centaurs. He was celebrated through all Greece for his wisdom and acquirements; and the greatest princes and heroes of the time were represented as his pupils. He was particularly skilled in surgery. When Hercules drove the Centaurs from Mount Pelion, they took refuge with Chiron in Malea; but their enemy pursued them even into this retreat, and unfortunately wounded his old teacher with a misdirected arrow. The speedy operation of

the poison in which the arrow had been dipped rendered remedies useless; and Chiron suffered the severest torments. The gods at his prayer put an end to his life, though his nature was immortal by reason of his descent from Kronos. After his death he was placed among the stars, and became the constellation Sagittarius.

Chiropody, the treatment by experts, male and female, of hand and human foot diseases and malformations, first became definitely known to science in the latter part of the 18th century. In 1785 a publication appeared in London under the title 'Chiropodologia,' treating in a scientific manner the causes of corns, warts, bunions, etc., with a detail of the most successful methods of removing all deformities of the nails and of preserving or restoring to the feet and hands their natural soundness and beauty.

When this and subsequent announcements of a similar nature first became known, the name was made the subject of much jesting and adverse criticism. In a magazine then current the name was condemned as "new-fangled." This evidently did not discourage the cultivators or patrons of the science, for during the same year, or early in 1786, a "chiropodist" opened his establishment in the English capital and did a thriving business.

By degrees the idea of having special care taken of the hands and feet spread throughout Great Britain. One hundred years after the establishment of a "Chiropodical Establishment" in London, a novelist in a magazine story referred to a lady who had "finished her chiropodistry," and in the same year a popular London weekly, by referring to the operations of chiropodists as "chiropody," gave the stamp of authority to that name as expressive of the craft specialty.

During the past 10 years chiropody has made vast strides in popular estimation as a useful if not essential factor in the acquisition of perfect personal comfort and cleanliness. In all large cities the list of operators in this line includes many men and women highly skilled in the proper treatment of diseased and malformed hands and feet. This is particularly true of the United States, notably New York city, where all barber shops of any pretensions now have a lady in attendance who undertakes to cleanse and purify the hands of customers while they are under the soothing influence of razor and lather brush.

Latterly there has been a clear distinction drawn between the specialists who, like the ladies who have their headquarters in the palaces of tonsorial artists, attend only to the hands, and others, mostly men, who give their attention principally to the feet. The former announce themselves to be "manicures," the latter "chiropodists." The chiropodist, as a rule, is fully qualified in both divisions of the work.

The service of chiropodists and manicures has become so essential and elaborate that it now embraces an extended vocabulary of its own. Surgical instrument makers have a special department for implements used by chiropodical operators. The skill with which these implements, many of them of razor-like keenness, are manipulated by competent operators is little short of marvelous. Holding the hand or foot of the subject gently, yet with a vise-like grip, they deftly turn their wrists to bring the instru-

CHIROPTERA — CHITIN

ments exactly to the required position around or beneath each nail, and, although the slightest error in movement may mean the crippling of the person under treatment, accidents of any kind are very rare indeed. See BUNION; CORN; NAIL; WART.

Chirop'tera. See CHEIROPTERA.

Chiru, chí'roo, a large antelope (*Pantholops hodgsoni*) native to the plateau of Tibet, especially in pine forests. It is about 32 inches tall, and pale in color. The buck has a black face, and long horns like those of the gazelle. It is wary to a degree that makes the autumnal hunts of the natives a matter of patience as well as of skill. This fine antelope is related to the saiga of Eastern Russia.

Chisel, an edged tool for cutting wood, iron, or stone. It is operated by striking its upper end with a hammer or mallet, or by pressure. It is one of the most ancient of tools. Chisels of sharp flint have always been used by savages to cut wood, and in very early times bronze ones were made which would cut the hardest stone. The ancient Egyptians carved most of their granite monuments with copper or bronze chisels, which are said to have cut as well as the best steel chisels of the present day. Chisels are now made in many different forms and for many kinds of work. Those used by sculptors, masons, and other workers in stone are merely short pieces of steel with sharp edges. The tool is held in the left hand and is made to cut by striking it on the end with a broad hammer called a mallet, made usually of wood. Blacksmiths, and other iron-workers use chisels much like those of stone-cutters, for cutting off bars of iron and like work. Carpenters and joiners' chisels are much finer tools, and usually have handles. They are made out of bar iron by forging, or hammering it while hot, and the edge of tool steel, is put in in the same way as the edge of an axe. Such chisels are made of many sizes, from an eighth of an inch up to several inches in width, and are used for different kinds of wood-cutting and -carving. Dovetails, mortises, and other such work are usually cut with chisels. A kind of chisel with a rounded blade, used for cutting grooves and round places in wood, is called a gouge.

Chis'elmouth. See CHUB.

Chisholm, William Wallace, American official: b. Morgan County, Ga., 6 Dec. 1830; d. De Kalb, Miss., 13 May 1877. In 1847 his family removed to Kemper County, Miss., and between 1858 and 1867 he was a justice of the peace and probate judge. During the Civil War he was a union man, but was continued in office, although regarded with suspicion by the Confederate authorities. After the war, a fusion of white unionists and negroes elected him sheriff. In 1877 a long standing personal and political feud between Chisholm and an opposing faction, led by John W. Gully, came to a head. On 26 April Gully was waylaid and murdered. His friends accused Chisholm and his party of being instrumental in bringing about the crime. Chisholm and four others were arrested on the morning of 29 April; a mob entered the village and insisted that Chisholm, who was in his own house in the custody of the sheriff, should be lodged in the jail. His wife,

daughter, and son, accompanied him there; the jail was shortly after attacked by the mob; Chisholm and his daughter receiving wounds that later proved fatal, while the son was killed in his father's arms by a shot from one of the leaders of the assailants. One of the other prisoners, Gilmer, had previously been killed by the mob. As there was no evidence to prove that Judge Chisholm had been implicated in the plot to kill Gully, the massacre was probably due to the animosity of the Democrats of the district, who, because Chisholm was enabled to control Republican favors, refused to abide by the existing conditions. In December 1877, Walter Riley, a negro, confessed that he had murdered Gully, and denied any knowledge or complicity on the part of Judge Chisholm or the latter's associates. See Wells, 'Chisholm Massacre' (1878). 'Kemper County Vindicated' gives the Democratic side of the affair.

Chisholm v. Georgia, in the United States supreme court, the case which led the several States to protect themselves from legal responsibility to individuals, while retaining legal powers of aggression. The Constitution provides (Art. iii., sec. 2): "The judicial power shall extend to all cases — between a State and citizens of another State." Under this provision Maryland was sued soon after the adoption of the Constitution, and acknowledged process by her attorney-general; but the case was compromised, and the question of jurisdiction did not come up. On 11 July 1792, Alexander Chisholm of South Carolina, as legatee in an inheritance case, served a process on the governor and attorney-general of Georgia to appear before the August term of the supreme court. Georgia instructed its attorney-general not to appear, and its counsel to enter a denial that States could be sued by individuals, or that the supreme court had jurisdiction in such cases, but not to argue the case. Chief Justice Jay and all the court except Iredell of North Carolina, found that the court had such jurisdiction; and a writ of inquiry was issued, but not served because Georgia passed an act making service of it a capital offense. Virginia was as angry as Georgia; and the Eleventh Amendment to the Constitution was introduced into Congress, passed by two thirds of both Houses 5 March 1794, ratified by the States, and declared in force, 8 Jan. 1798. It reads: "The judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by citizens of another State, or by citizens or subjects of any foreign state." This leaves the constitutional provision hanging in the air, unless construed as meaning "between a State as *plaintiff* and citizens of another State"; and thus the southern Confederacy made the corresponding article of its constitution read.

Chitin, or **Chitine,** kí'tin ($C_{15}H_{26}N_2O_{10}$), the horny substance which gives firmness to the tegumentary system and other parts of the *Crustacea*, *Arachnida* and insects; probably also the carapace of the *Rotatoria* consists of it. It is left when the above structures are exhausted successively with alcohol, ether, water, acetic acid, and alkalies. It is colorless and amorphous,

CHITON — CHITTENDEN

and is usually classed a proteid. It is dissolved by concentrated mineral acids without the production of color. It is not dissolved by solution of potash, even when boiling; neither does it give the characteristic reactions with Milton's or Schultze's tests.

Chiton, kī'tōn, a genus of *Mollusca* and the common name of the same, the shells of which are boat-shaped, and consist of a median series of symmetrical plates, folding over each other, and implanted in the mantle, the marginal zone of which is studded with spicules. It is the typical genus of the family *Chitonidae* of the class *Amphineura*.

This class is remarkable among the *Mollusca* in having certain of the organs distinctly segmented. The body is sole-shaped, symmetrical, and without distinct head or tentacles, but with a lateral fringe of gills. No eyes corresponding to those of snails are present, but very numerous eyes are scattered all over the back. The alimentary canal is much like that of a snail, being much convoluted, and provided at the anterior end with a muscular tongue and toothed radula. On the other hand the nervous system is unique in consisting of two pairs of longitudinal ganglionated cords, one of which, the pedal pair, is provided with transverse connective at intervals.

The chitons cling firmly to rocks, etc., by means of the powerful foot, many of them resisting the heaviest beat of the surf. Only very small species (*Chætopleura*, etc.) are found on the eastern Atlantic coast, but larger species occur in Florida and the Gulf of Mexico, while California has the giants of eight or ten inches of the genus *Cryptochiton*. Consult Hubrecht, 'Quarterly Journal of Microscopical Science,' 1882.

Chiton, kī'tōn, the undergarment of the ancient Greeks. In the earliest times it was worn by the men only; in later times there were two forms, and the chiton was worn by both sexes. The Dorian chiton was sleeveless, reaching about to the knees, and usually left more or less open on the right side. The Ionian was a long tunic reaching to the feet, closed on the sides, sometimes sleeveless, but often with short or long sleeves. Both forms were usually worn belted in at the waist.

Chit'or, or **Chittore**, India, a town and fort of Hindustan, in the native state of Oodeypore, Rajputana, on the Gamneri River, about 70 miles northeast of the town of Oodeypore. The town was for several centuries capital of Oodeypore, and was far more prosperous and wealthy than it is at present. It still contains many temples and other well-constructed buildings. The fort, formerly considered one of the strongest in India, stands upon a high rock overlooking the town. Pop. 11,000.

Chitra. See **AXIS**.

Chitral, chīt-rāl', British India, a native state, having Yasin and Gilgit on the east, Swat, Dir, and Bajaur on the south, Kafiristan on the southwest, and the Hindu Kush mountains on the north and northwest. Through it flows in a southwest direction the Chitral or Kunar or Kashkar River, a tributary of the Kabul, and on it, in about lat. 36° N., stands the town of Chitral at a height of more than 5,000 feet above sea-level. The people are Moslems, but

mostly speak a language closely akin to that of their pagan neighbors in Kafiristan. Upper Chitral, with its capital Mastuj, is closely connected with Gilgit. Lower Chitral enjoyed till recent times undisturbed independence; but in 1894 an English resident and small body of troops were surrounded and besieged in Chitral, the consequence of which was that in March 1895 an expedition was sent (the main body by the Swat valley, the other from Gilgit), which after some sharp fighting advanced triumphantly through extremely difficult country, relieved the besieged, and annihilated all opposition.

Chittagong, chīt-ta-gōng', India, district in the presidency of Bengal, Hindustan. The district has Tipperah on the north, the Chittagong Hill Tracts on the east, Arracan on the south, and the Bay of Bengal on the west. Its area is 2,563 square miles, and it has a population of about 1,300,000. The Blue Mountains, on the northeast, attain a height of 5,600 feet. The principal river is the Karnaphuli, or Chittagong. The level lands, chiefly on the coast, and the valleys are very fertile. The principal exports are timber, canvas, coarse cloths, and elephants. A considerable majority of the inhabitants are Mohammedans. The city of Chittagong, the capital of the district, is situated on the right bank of the Karnaphuli, 12 miles from its mouth and 220 miles east of Calcutta, and is the second port of Bengal. It consists of a series of detached houses on little hills. Although its climate is unhealthful, it is an important industrial and trade centre, among its exports being rice, jute, jute manufactures, and tea. Pop. 25,000.

Chittagong Wood, the wood of several Indian trees, especially of *Chickrassia tabularis*. It is a light-colored beautifully grained wood used by cabinet-makers. It is light in weight but does not wear well in changeable climates, as it warps in dry weather. The wood of *Cedrela Toona* receives the same name.

Chit'tam-wood, or **American Smoke-tree** (*Continus cotinoides*), belongs to the sumac family. It is a small tree with wide spreading branches growing to the height of about 40 feet. It flourishes during the months of April and May in Tennessee and Alabama and westward to Missouri and Indian Territory. A rich dye for commercial use is extracted from the orange-yellow wood, which weighs about 40 pounds to the cubic foot.

Chit'tenden, **Hiram Martin**, American military engineer: b. New York 25 Oct. 1858. He has supervised engineering government works in the Yellowstone National Park and elsewhere, and has published 'The Yellowstone National Park: Historical and Descriptive' (1893); 'Reservoirs in the Arid Regions' (1897); 'Reservoir System of the Great Lakes' (1898); 'The American Fur Trade of the Far West' (1901).

Chittenden, **Russel Henry**, American educator: b. New Haven, Conn., 18 Feb. 1856. He was graduated at Yale in 1875, and took a course at Heidelberg. He became professor of physiological chemistry at Yale in 1882, and since 1896 has been director of the Sheffield Scientific School. He has written 'Digestive Proteolysis'; 'Studies in Physiological Chemistry,' and similar works.

Chittenden, Thomas, American colonial and State governor: b. East Guilford, Conn., 6 Jan. 1730; d. Williston, Vt., 24 Aug. 1797. He was one of the pioneers of Vermont, settling upon the New Hampshire grants in 1774, and acquiring a fortune from his lands. In 1778 he became Governor of Vermont, before its formal separation from New York was recognized. During the Revolutionary War the English and the Continental Congress receiver overtures from him, his terms being recognition of Vermont's statehood. He retired from public life in 1796.

Chittim. See **KITTIM**.

Chittoor, chit-toor', or **Chittur**, India, a town, capital of North Arcot district, Madras. It contains courts and public offices, an English church and a Roman Catholic chapel. Pop. 10,000. There is a town of the same name in the state of Cochin, Madras, with about the same population.

Chit'ty, Joseph, English lawyer and legal writer: b. 1776; d. London 17 Feb. 1841. He acquired great reputation by his legal text-books. These comprise a 'Treatise on Bills of Exchange' (1799); 'Treatise on the Parties to Actions and to Pleadings' (1808); 'Treatise on the Law of Nations Relative to the Legal Effects of War on the Commerce of Belligerents and Neutrals' (1812); 'A Practical Treatise on the Criminal Law, Adapted to the Use of the Profession, Magistrates, and Private Gentlemen' (1816); 'Treatise on Commercial Law' (1818); 'Collection of the Statutes of Practical Utility' (1829-37); 'Treatise on Medical Jurisprudence' (1834).

Chiusi, kē-oo'sä, Italy, a town in the province of Sienna, 102 miles north-northwest of Rome, on an olive-clad eminence in the Val di Chiana, not far from the small Lago di Chiusi. In ancient times, under the name of Ciusium, it was one of the 12 republics of Etruria, and the residence of Porsenna. When Italy was overrun by the barbarians, it fell into decay, the whole valley was depopulated, and became the pestilential pool described by Dante. Since the improvement of the course of the Chiana, Chiusi has begun to flourish again along with the whole district. It is in connection with the discovery of Etruscan antiquities, however, that the place is chiefly heard of. During the 19th century immense quantities of these remains were found in the neighborhood in the grottoes that served the ancient Etruscans as tombs. They consist chiefly of sun-dried black earthenware vases, ornaments, relievos, and carved stonework, and are preserved in the museums at Chiusi and Florence.

Chiv'alry (Fr. *chevalerie*, from *cheval*, Lat. *caballus*, "a horse"), a term which indicates strictly the organization of knighthood as it existed in the Middle Ages, and in a general sense the spirit and aims which distinguished the knights of those times. The chief characteristics of the chivalric ages were a warlike spirit, a lofty devotion to the female sex, a love of adventure, and a thirst for glory.

To explain the nature and origin of chivalry we must consider the character of the ancient German tribes. The warlike spirit was common to them with other barbarous nations; but there were certain traits in their character pe-

culiarly their own. Among these was their esteem for women. This is dwelt upon by Tacitus, and is sufficiently apparent from the early native German historians. This regard for the female sex was diffused by them through every country into which they spread, though with considerable difference in the forms in which it developed itself. In France it became that refined gallantry for which the nation has been so long conspicuous; in Spain it assumed a more romantic and glowing character, displaying much of the fire of Oriental feeling; in Germany itself it became faithful and tender attachment to the wedded wife. Engrafted upon this primitive regard for woman amongst the Germanic tribes, the moral and æsthetic principles of the Christian Religion, its ideals of chastity, marriage and loyalty, and in particular the widespread veneration paid to the Virgin Mother of Christ, powerfully contributed to the development of the institutions of chivalry. We may be told, in answer to our claim of the peculiar regard for the female as a characteristic of the Teutonic tribes, that women were held in high esteem by the Romans. It is true that wives and mothers were treated with great regard by the Romans, and the history of no nation affords more numerous instances of female nobleness; but this esteem was rendered to them, not as females, but as the faithful companions and patriotic mothers of citizens. It had somewhat of a political cast. But this was not the case with the Germans. There is another trait of the German character which deserves to be considered in this connection, which is very apparent in their literature, and the lives of many individuals; we mean that indefinite thirst for something superior to the realities of life, that *sehnen*, to use their own word, which hardly admits of translation, which has produced among them at the same time so much excellence and so much extravagance. These three traits of the Teutonic race, their warlike spirit, their esteem for women, and their indefinable thirst for superhuman greatness, together with the influence of the feudal system and of the Roman Catholic religion, afford an explanation of the spirit of chivalry — an institution which, to many observers, appears like an isolated phenomenon in history, and leaves them in doubt whether to despise it as foolish or admire it as sublime. The feudal system divided the Christian Teutonic tribes into masses, the members of which were united, indeed, by some political ties, but had little of that intimate connection which bound men together in the communities of antiquity, and which has produced like effects in our own and a few preceding ages. They still preserved, in a great measure, the independence of barbarians. There was, however, one strong bond of union which gave consistency to the whole aggregate; we mean the Roman Catholic religion. The influence of a common religion was of great service to mankind, during the ages of turbulence and violence, in giving coherency to the links of the social chain, which were continually in danger of parting. To this cause is to be ascribed the great uniformity of character which prevailed during the ages of chivalry. The feudal system, besides, enabled the gentry to live on the labors of the oppressed peasants without the necessity of providing for their own support, and to indulge the love of adventure incident to their warlike and ambitious

CHIVASSO

character. If we now combine the characteristics which we have been considering — a warlike spirit, a lofty devotion to the female sex, an undefinable thirst for glory, connected with feudal independence, elevation above the drudgery of daily toil, and a uniformity of character and purpose, inspired by the influence of a common religion — we obtain a tolerable view of the chivalric character. This character had not yet quite developed itself in the age of Charlemagne. The courage exhibited by the warriors of his age was rather the courage of individuals in bodies. The independence, the individuality of character, which distinguished the errant knight who sought far and wide for adventures to be achieved by his single arm, was the growth of a later period. The use of the war-horse, which formed so essential an instrument of the son of chivalry, was not common among the Germans until the time of their wars with the Huns. They were, indeed, acquainted with it before, and Tacitus mentions it in his account of Germany; but it was not in common use among them till the period we have mentioned. After it was introduced, cavalry was considered among them, as among all nations in the early stages of their progress, much superior to infantry, which was, in fact, despised, until the successes of the Swiss demonstrated its superiority. In the 11th century knighthood had become an established and well-defined institution; but it was not till the 14th that its honors were confined exclusively to the nobility. The Crusades gave a more religious turn to the spirit of chivalry, and made the knights of all Christian nations known to each other, so that a great uniformity is thenceforward to be perceived among them throughout Europe. Then arose the religious orders of knights, the knights of St. John, the Templars, the Teutonic knights, etc. The whole establishment of knighthood assumed continually a more formal character, and, degenerating, like every human institution, sank at last into quixotic extravagances, or frittered away its spirit amid the forms and punctilios springing from the pride and the distinctions of the privileged orders of society. It merged, in fact, among the abuses which it has been one of the great labors of our age to overthrow. The decline of chivalry might be traced through the different forms which it assumed in different nations as distinctly as its development — a task too extensive for this work.

The education of a knight was briefly as follows: The young and noble stripling, generally about his 12th year, was sent to the court of some baron or noble knight, where he spent his time chiefly in attending on the ladies and acquiring skill in the use of arms, in riding, etc. This duty of waiting about the persons of the ladies became, in the sequel, as injurious to the morals of the page as it may have been salutary in the beginning. When advancing age and experience in the use of arms had qualified the page for war, he became an *escuyer* (esquire or squire). This word is generally supposed to be derived from *escu* or *scudo* (shield, *scutum*), because among other offices it was the squire's business to carry the shield of the knight whom he served. The third and highest rank of chivalry was that of knighthood, which was not conferred before the 21st year, except in the case of distinguished birth or great achievements. The individual prepared himself by confessing,

fasting, etc.; religious rites were performed; and then, after promising to be faithful, to protect ladies and orphans, never to lie or utter slander, to live in harmony with his equals, etc. (in France there were 20 vows of knighthood), he received the *accolade*, a slight blow on the neck with the flat of the sword from the person who dubbed him knight, who at the same time pronounced a formula to this effect: "I dub thee knight, in the name of God and St. Michael (or in the name of the Father, Son, and Holy Ghost). Be faithful, bold, and fortunate." This was often done on the eve of battle, to stimulate the new knight to deeds of valor, or after the combat, to reward signal bravery.

Though no man of any reflection would wish for the return of the age of chivalry, yet we must remember that chivalry exercised, in many respects, a salutary influence at a time when governments were unsettled and laws little regarded. Though chivalry often carried the feelings of love and honor to a fanatical excess, yet the reverence paid to them contributed to prevent mankind, at this period of lawless violence, from relapsing into barbarism; and as the feudal system was unavoidable, it is well that its evils were somewhat alleviated by the spirit of chivalry. The influence which chivalry had on poetry was very great. The *troubadours* in the south of France, the *trouvères* in the north of the same country, the "minstrels" in Great Britain, the *minnesinger* in Germany, sang the achievements of the knights who received them hospitably. In Provence arose the "Courts of Love," which decided the poetical contests of the knights. At these, amorous songs (*chansons*), duets (*tensons*), pastoral songs (*pastourelles*), and poetical colloquies (*sirventes*), were performed. In Germany the chivalric spirit produced one of the most noble epics, the 'Nibelungenlied' (q.v.). It was the spirit of chivalry which led to the Crusades, and from the intercourse with the East which grew up during this period the wonders of Oriental enchantment were introduced into the romantic or chivalric poetry, and European literature received a great stimulus. Chivalric poetry, however, existed apart from any influence of this kind, and really begins with the mythological cyclus of King Arthur's round table and the feats of his knights, which furnished materials that found poetic treatment in various European countries. A second cyclus is that of Charlemagne and his paladins, his 12 peers, which remained a poetical foundation of chivalric poetry for many centuries. Alexander the Great also became a great hero of chivalric poetry. The cyclus of Amadis, which belongs, perhaps, exclusively to Spain, does not rest on any historical ground. For further information see the essay on chivalry written by Sir Walter Scott; Heeren's 'Essay on the Influence of the Crusades'; 'Mémoires sur l'Ancienne Chevalerie, par Lacurne de Sainte-Palaye' (2 vols., with engravings); Gautier's 'La Chevalerie'; Henne am Rhyn's 'Geschichte des Rittertums'; Gautier, 'La Chevalerie'; and 'Don Quixote.' See also DUELING; MIDDLE AGES; TOURNAMENT.

Chivasso, kē-vās'sō, Italy, a town on the Po, 14 miles northeast of Turin. It was formerly strongly fortified, and contained the residence of the dukes of Montferrat. Pop. 10,000.

CHIVE — CHLORAL

Chive, or **Cive**, a perennial herb (*Allium Schœnoprasum*), of the natural order *Liliaceæ*. It is a native of Europe, Asia, and the northern parts of North America, but has been introduced in temperate climates as a vegetable. It has small, flat, clustered bulbs which multiply laterally to form clumps. The leaves, which grow in dense profusion, are tubular, five to eight inches long; and the flowers, which are borne in umbels, are purplish, pinkish, or violet. Aside from the use of the leaves as a flavoring for soups, stews, salads, etc., the plants are frequently used for ornamental purposes, since they make excellent edgings for flower-beds. They are readily propagated by division, a process that should be performed as soon as the clumps become very dense. The plants do well in any good garden soil with no attention except weeding, and they may be clipped for use frequently during the growing season. Their flavor resembles that of onions.

Chizerots (shē-zè-rō) and **Burins**, bū-răn, one of those peculiar races in France that live isolated in the midst of the rest of the population, and are despised and hated by their neighbors. They are found in the arrondissement of Bourgen-Bresse, in the department of Ain; and the communes of Sermoyer, Arbigny, Boz, and Ozan belong to them. According to tradition, they are descended from the Saracens. Though industrious and prosperous, they are held in the utmost contempt and detestation by their peasant neighbors, often themselves indolent and destitute. They are looked upon as covetous and malicious, and scarcely would the daughter of a small farmer or well-to-do day-laborer become the wife of one of them, so that they mostly marry among themselves. From time immemorial, they have been field-laborers, cattle-dealers, butchers, and the like. Many of them are very good-looking, the young women in particular being handsome and clear-complexioned, with large black eyes.

Chladni, hlād'nē, **Ernst Florens Friedrich**, German physicist, one of the founders of the science of acoustics: b. Wittenberg 30 Nov. 1756; d. Breslau 4 April 1827. He adopted the profession of jurisprudence, which he practised first in his native town, and afterward at Leipsic, but his natural taste led him to study music, and to devote his leisure to physical science. The backward state of the theory of music compared with the other physical sciences early opened up to him a neglected mine of scientific discovery; and at the age of 19 he set himself resolutely to investigate it. By covering plates of glass with fine sand, and causing them to vibrate, he discovered the fundamental fact in the science of acoustics, that the communication of vibrations in material bodies is subject to constant mathematical laws. See SOUND. His scientific investigations led him to travel through the principal countries of Europe and visit its principal capitals. He invented the euphone about 1789 and clavicylinder 1800, instruments more curious than useful, in which musical sounds are produced by friction, and by the revolution of a glass cylinder causing the vibration of chords. His scientific works are of quite a different value. The first of them, 'Entdeckungen über die Theorie des Klanges,' appeared in 1787; 'Acoustics' (which he himself translated into French, 1809), in 1802; 'Neue

Beiträge zur Akustik,' (1817); 'Ueber Feuermeteore,' (1820).

Chladni Figures. See SOUND.

Chlamydosaurus, klām-ī-dō-sâ'rūs. See FRINGED DRAGON.

Chlamyphorus, a genus of armadillos, containing the pichiciago. See ARMADILLO.

Chlamys, klā'mīs. (1) In ancient Greek costume, a light and freely flowing scarf or plaid, worn as an outer garment. It was oblong in shape, generally twice as long as its width, and was worn, according to taste or circumstances, in different ways. The chlamys of the youth was probably of a yellow color, while that of the soldier was scarlet. It was also carried by hunters and travelers, and some Romans are recorded as having adopted it. (2) In zoology, the name of a genus of coleopterous insects, belonging to the sub-tribe *Cyclica*, and the family *Chrysomelidæ*. There are but few North American species, and none of large size.

Chloasma, klō-az'mā, a peculiar pigmentation of the skin, of a yellowish, brownish to blackish shade, and due to a number of causes: (1) mechanical; (2) chemical; (3) thermal; (4) parasitic. Scratching is one of the most frequent mechanical causes. The irritants of mustard plasters, capsicum, cantharides,—all may cause an abnormal skin pigmentation. Sunburn is a frequent cause, a bringing out of the spots with greater vividness. Parasitic fungi have been known to cause it. In addition there are a large number of miscellaneous conditions associated with these liver spots. Pregnancy, menstruation, constipation,—one or all may emphasize their characters. Certain diseases, such as syphilis, Addison's disease (q.v.) in particular, and forms of anæmia are associated with excessive pigmentation. In only a small proportion of the cases has the liver anything to do with the condition.

Chlopicki, hlō-pīt'skē, **Joseph**, Polish general: b. Galicia 24 March 1772; d. Cracow 30 Sept. 1854. He served under Kosciuszko, during the first revolt of the Poles (1794), and then engaged in Napoleon's service, under whom he took part in the battles of Eylau, Friedland, Smolensk, and Moskowa. After the fall of Paris in 1814, he conducted back to Poland the débris of the Polish-French contingent, and was created general of division by the czar. On the outbreak of the Polish revolution of 1830, he was elected dictator, but soon resigned that office, fought at Grochow and Wavre, and after the cessation of hostilities, retired into private life.

Chlo'ral, a chemical substance resembling aldehyde in many of its properties, and obtainable from aldehyde by the action of chlorine gas. In its practical manufacture, however, it is formed by passing chlorine through cold absolute alcohol; a crystalline alcoholate of chloral is thereby formed, from which the chloral itself is afterward set free by the action of sulphuric acid. Chloral is a colorless liquid at ordinary temperatures, having the formula CCl_3CHO . It freezes at about -100°F ., and boils at 208°F . It combines directly with water, forming chloral hydrate (q.v.), $\text{CCl}_3\text{CH}(\text{OH})_2$, which is the substance commonly but incorrectly called "chloral."

CHLORAL HYDRATE — CHLORINE

Chloral Hydrate, a crystalline solid composed of trichloral aldehyde with one molecule of water. The crystals are single, colorless, and transparent rhomboids with an aromatic penetrating and smarting taste and slightly acrid odor. They are freely soluble in water, alcohol, and ether. Chloral hydrate is a powerful germicide but is rarely used as such save to preserve anatomical preparations. It is a vesicant and a local analgesic. In small doses it causes burning sensations of the stomach, but little general action. Full medicinal doses, 5 to 15 grains, cause a slowing of the pulse, dilatation of the arterioles, lowering of blood pressure, and slowing of the respiration. On the nervous system it acts as a depressant, causing sleep by direct action on the brain cells. Large doses cause poisoning with symptoms of collapse, coma with a feeble, thready pulse, lowering of temperature, cyanosis or lividity, cold perspiration, dilated pupils, and loss of reflexes. Death results from respiratory and cardiac paralysis. Treatment of poisoning is by rousing patient to maintain respiratory centre, artificial heat, artificial respiration, hot coffee by mouth or rectum, and cardiac stimulants. Chloral is particularly valuable in insomnia from overwork and in many of the convulsive disorders, titany, myoclonus, status epilepticus, and delirium tremens. Its action is possibly due to the formation of chloroform in the general circulation, by the action of the alkalis contained in the blood, in accordance with the equation $\text{CCl}_3\text{CH}(\text{OH})_2 + \text{KOH} = \text{CHCl}_3 + \text{H}_2\text{O} + \text{CHO.OK}$, the last formula in this equation being that of potassium formate. It is also useful in states associated with high arterial tension if the heart is not weakened. Within recent years a large number of allied drugs have been introduced. They have similar actions but are more palatable or are thought to cause less heart depression. Among these may be mentioned, chloralamid, chloretone, chloralose, and urethan.

Chloralamide, klō-rāl'a-mīd, or **Chloral For'mamide**, fōr'ma-mīd, a substance formed by the action of formamide upon chloral, and usually obtained in lustrous, colorless crystals with a slightly bitter taste. It has the chemical formula $\text{CCl}_3\text{CH} \begin{matrix} \text{OH} \\ \diagup \\ \text{NH} \end{matrix} \text{CHO}$ melts at 240°F. , and is soluble in 26 parts of water and in a much smaller quantity of alcohol. It is not decomposed by dilute acids, but is decomposed by alkalis, and also by water at temperatures above 140°F. See also CHLORAL.

Chloralimide, klō-rāl'ī-mīd, a substance occurring in long, colorless, needle-like crystals, with the formula $\text{CCl}_3\text{CH}:\text{NH}$. It is insoluble in water, but dissolves readily in alcohol, ether, and chloroform. It is used in medicine as an antipyretic and analgesic, and must not be confounded with chloralamide (q.v.).

Chlorastrolite, klō-ras'-trō-līt, a mineral found in the form of rounded pebbles on the shores of Isle Royale, Lake Superior, and derived from the trap rock in the vicinity. It is bluish-green in color, with a hardness of 5.5 and a specific gravity of 3.18. According to Hawes it is an impure variety of prehnite, but for optical reasons Lacroix classes it under thomsonite. Its name is from the Greek and signifies "green star," in allusion to its color and its stellated structure.

Chlo'rates. See CHLORIC ACID.

Chlo'ric Acid, a colorless, strongly acid liquid, having the formula HClO_3 and a specific gravity of 1.28. It combines with bases to produce the salts known as chlorates. Potassium chlorate is formed directly when chlorine gas is passed through a warm, concentrated solution of caustic potash. By treating this salt with sulphate of ammonia and adding barium hydrate, barium chlorate, $\text{Ba}(\text{ClO}_3)_2$, is formed, from which chloric acid is set free by the action of sulphuric acid. Chloric acid has powerful bleaching properties, owing to the facility with which it parts with its oxygen. Paper that is dipped into a strong solution of the acid takes fire spontaneously upon drying. The most important salt of chloric acid is potassium chlorate, which is largely used in the preparation of oxygen gas, in the manufacture of matches, and in medicine. It crystallizes in monoclinic plates having a specific gravity of 2.35.

Chlo'ric Ether, a name given (1) to spirits of chloroform, a liquid consisting of one part of chloroform to nine of alcohol, and (2) to chloride of ethyl, $\text{C}_2\text{H}_5\text{Cl}$, which is obtained by passing dry hydrochloric acid gas through alcohol.

Chlorides. See HYDROCHLORIC ACID.

Chlorim'etry, the art of estimating the quantity of chlorine present in bleaching-powder or any other hypochlorite. Several methods are employed, depending for their success upon the oxidizing power of chlorine. See CHEMICAL ANALYSIS.

Chlorine, klō'rīn, a gaseous element, discovered in 1774 by Scheele, who named it dephlogisticated marine acid. The term "dephlogisticated" had exactly the same import as "oxygenated," which was soon afterward introduced by Lavoisier. Davy showed that the substance is not a compound of oxygen, but a simple body or element, and from its peculiar yellowish-green color the name "chlorine" was given to it. Chlorine gas is obtained by heating a mixture of hydrochloric acid and finely powdered peroxide of manganese, and may be collected either in bottles over warm water in the pneumatic trough, or by simply leading the delivery-tube to the bottom of the collecting-bottle, and allowing the chlorine to displace the air. The reaction is



Deacon's process for the commercial manufacture of chlorine consists in passing a mixture of hydrochloric acid gas and hydrogen over tiles that are soaked in a copper salt, and then dried and heated to a temperature of about 700° to 750°F. At this temperature the hydrochloric acid gas is decomposed with the formation of water and liberation of chlorine; the copper salt being apparently unaffected by the action. Chlorine is now largely (and perhaps chiefly) manufactured by the electrolysis of a solution of chloride of sodium (common salt).

Under ordinary atmospheric conditions chlorine is gaseous, but it condenses into a mobile yellow liquid at a pressure of about four atmospheres. It also liquefies at the ordinary atmospheric pressure at about 28°F. below zero. It has the chemical symbol Cl , and its atomic weight is usually given as approximately 35.4 for $\text{H} = 1$. It is two and a half times heavier

CHLORINE

than atmospheric air, and has an insupportable suffocating odor. When pure it occasions immediate death to an animal immersed in it; but even when largely diluted with common air it cannot be respired with safety. It occasions a severe sense of stricture at the breast, which renders it impossible to make a full inspiration. Chlorine is somewhat soluble in water, the solution having the color and odor of the gas. If the solution be cooled, long yellow crystalline needles deposit, consisting of a hydrate of chlorine. When exposed to sunlight the solution gradually loses its color, oxygen is liberated, and the water contains hydrochloric acid in solution. The great affinity of chlorine for hydrogen is one of its most characteristic properties, and is exhibited in a number of reactions. If equal volumes of hydrogen and chlorine gas be mixed in the dark and then exposed to diffused daylight, gradual combination takes place; and if the mixture be exposed to direct sunlight the gases combine at once with an explosion and produce hydrochloric acid. This is the only compound these substances form with each other, and it is one of the most important of the acids. When a lighted taper is immersed in a jar of chlorine, it burns with a smoky flame; this is due to the combination of the chlorine with the hydrogen only, and the liberation of the carbon. Similarly, when hydro-carbons like turpentine and olefiant gas are mixed with chlorine and a light applied, a ruddy flame with a copious deposition of carbon shows that the hydrogen and chlorine are alone combining. Several of the elements catch fire when immersed in chlorine, for instance, phosphorus, arsenic, antimony, and copper; while others combine with it at a higher temperature, sometimes with vivid combustion as in the case of potassium. The binary compounds of chlorine with the other elements are termed chlorides, and next to the oxides they are the most abundant and widely distributed substances in the earth, many of them being also of great importance for manufactures. Common salt, the chloride of sodium, is the most plentiful of all, and forms large rock masses in various parts of Europe, and occurs dissolved in the waters of the ocean and of many salt lakes. It is the ultimate source of all the hydrochloric acid and chlorine of commerce. Other chlorides, as of potassium, calcium, etc., are met with, but in no case nearly so abundantly as common salt. As a class, the metallic chlorides are crystallizable salts, readily soluble in water, some being even deliquescent. The chloride of silver, the subchloride of mercury, and one or two others are, however, insoluble in water, while a few are decomposed by water. From its wide affinities and great activity in the free state, chlorine is one of the most useful and powerful instruments with which the chemist deals. By it such metals as platinum and gold are attacked and made soluble in water, while its power over organic substances is very great, and has resulted in the formation not only of a number of compounds by simple union with it, but of a great number into which the chlorine has entered more intimately and produced what are called substitution compounds.

Chlorine is largely consumed in the arts. Thus it is used in the manufacture of potassic chlorate, in the conversion of the yellow to the red prussiate of potash, in the preparation of chloride of sulphur for vulcanizing, and above all

as a bleaching and disinfecting agent. This last property is exercised by chlorine by virtue of its power of decomposing water by combining with the hydrogen and liberating oxygen, which latter substance is the true agent in the operation, and which converts the coloring matter into colorless compounds. Berthollet was the first to apply chlorine to the process of bleaching. The method of using it has been successively improved. It consisted at first in subjecting the thread or cloth to be bleached to the action of the gas itself; but the effect in this way was unequally produced, and the texture was sometimes injured. It was then applied in a dilute aqueous solution. The thread or cloth was prepared as in the old method of bleaching, by boiling first in water and then in alkaline lye; it was then immersed in the diluted chlorine, and this alternate application of alkali and chlorine was continued until the color was discharged. The offensive suffocating odor of the gas rendered this mode of using it, however, scarcely practicable; but the odor was found to be removed by a weak solution of potash; lime immersed in water, being more economical, was afterward substituted. Later a compound of chlorine and lime was employed, prepared by exposing slaked lye to chlorine gas; the gas is quickly absorbed by the lime, and the chloride of lime, or bleaching-powder, as it is called, being dissolved in water, forms the bleaching-liquor now generally employed. (See BLEACHING-POWDER.) In using it the cloth is first commonly steeped in warm water to clean it, and is then repeatedly washed with an alkaline solution so diluted that it cannot injure the texture of the cloth; the cloth is then washed and steeped in a very weak solution of chloride of lime, again washed, acted on by a boiling lye as before, and again steeped in the solution; and these operations are performed alternately several times. The cloth is lastly immersed in very dilute acid, which reacts on the bleaching-powder and liberates chlorine; this then attacks the coloring matter, and the cloth soon acquires a pure white color. It is next repeatedly washed with water to remove the last traces of the lime salts, and then it is exposed to the action of a hyposulphite in order to render inoperative any chlorine that may remain. (See ANTI-CHLOR.) The cloth is finally washed, dried, and dressed. When sulphuric acid is used to liberate the chlorine it is found more difficult, in the subsequent washing, to remove the calcic sulphate formed, on account of its sparing solubility in water. To avoid this, chloride of magnesia has been substituted for the chloride of lime. It is easily prepared by adding sulphate of magnesium to a solution of chloride of lime and straining off the clear fluid. It has the same bleaching power, is easily removed by washing, and is said to leave the cloth in a more supple state than when ordinary bleaching-solution has been employed. Another important application of chlorine gas and of bleaching-powder is to the destruction of disease germs. Acid vapors, sulphurous acid in particular, under the form of the fumes of burning sulphur, are often employed for that purpose; but chlorine is superior to any other agent, and is now widely employed for the purposes of fumigation and disinfection.

In medicine, chlorine gas dissolved in water is used extensively for bactericidal purposes. It is employed as a mouth-wash and for bathing

CHLORIS — CHLOROPHYLL

purposes, being both a deodorant and a bactericide; and internally has been used for its germicidal properties, particularly in typhoid fever.

Chloris, klō'ris. (1) The Greek goddess of flowers and the wife of Zephyrus, identical with the Flora of the Romans. (2) The daughter of the Orchomenian Amphion, the wife of Neleus and the mother of Nestor. (3) The daughter of the Theban Amphion and of Niobe. When the children of Niobe was killed she alone escaped along with Amyclas, and became so pale from terror that her former name of Melibœa was exchanged for that of Chloris.

Chlo'ris, or **Prairie Chloris** (*Chloris verticillata*), a genus of grasses, of which there are some 60 or more species, mostly natives of warm, dry countries. About 10 of these species are found on the prairies, from Kansas to Texas. *Chloris radiata* is a pretty annual grass frequently cultivated in greenhouses for the sake of its ornamental and curious appearance.

Chlo'rite Group, in mineralogy, a group of minerals crystallizing in the monoclinic system, exhibiting a green color from the presence of ferrous iron, and chemically definable as hydrous silicates of aluminum, ferrous iron and magnesium. They are usually secondary minerals, derived from pyroxene, amphibole, and other forms. They exhibit a marked basal cleavage suggestive of mica; but they differ from mica and its allies by not containing any considerable amounts of calcium or of the alkalis.

Chlorite Schist, shīst. As chlorite is a general name for green secondary hydrated silicates, containing alumina and iron, derived particularly from augite, hornblende, and biotite, so chlorite is used as a prefix to various names of rocks that contain such silicates, for example, chlorite schist. In the wide belt of Algonkian and Archæan rocks stretching from Labrador to the west end of Lake Superior are great areas of chlorite schists resulting from the alteration of sedimentary as well as igneous rocks.

Chlorodyne, klō'rō-dīn or -dēn, a proprietary mixture of uncertain composition, and best represented by the National Formulary formula, which is a mixture of chloroform, cannabis indica, morphine, and tincture of capsicum. Practically all of the chlorodynes on the market contain morphine, and hence are dangerous poisons. Their sale should not be permitted save on a physician's prescription.

Chlor'ofom (CHCl_3 , trichloromethane, methenyl chloride, terchloride of formyl), a heavy, clear, colorless, mobile, and diffusible liquid of a sweet burning taste and characteristic ethereal odor formed by the action of the sun's rays on a mixture of chlorine and marsh gas; also by the action of caustic potash on chloral or chloracetic acid, or by the action of nascent hydrogen on tetrachloride of carbon. It is prepared on a large scale by distilling water and alcohol with bleaching powder. Its vapor density is four times that of air. Its specific gravity should not be below 1.49, and it should be soluble in 200 volumes of cold water, and in all proportions in alcohol, ether, benzol, benzine, and fixed and volatile oils. It is volatile, even at low temperatures, boils at 140°F . and freezes at -94°F . It should not be exposed to the light, as it is liable to decomposition with the liberation of hydrochloric acid and chlorine.

As used in medicine it is a liquid consisting of 99 to 99.4 per cent by weight of absolute chloroform and 1 to 0.6 per cent of alcohol. It is not inflammable, but its vapor burns with a greenish flame. It is an excellent solvent for a variety of substances, as caoutchouc, resins, fats, alkaloids, etc. Medicinally it is used as an aqua, emulsion, liniment, spiritus, and pure U. S. P. chloroform. Its physiological action is allied to the alcohols, but it is much more energetic. Externally chloroform is an irritant, and if confined on the skin it can cause blistering. It is irritant to mucous membranes, and, taken into the stomach, causes a sense of warmth and burning with increased production of gastric secretions. In large doses it causes violent gastro-enteritis.

Its chief use in medicine is as a general anæsthetic, for which purpose it was first used by Simpson, of Edinburgh, in 1848. As an anæsthetic its vapor is inhaled; it thus enters the circulation through the blood circulating in the lungs. When so administered the stages of anæsthesia closely resemble those induced by others of the alcohol series, but in chloroform the anæsthesia is very rapid. There is first a stage of excitement, with heightened cerebral activities. This is soon followed by a gradual dissolution of the mental faculties, usually in an order the reverse of their complexity. Thus the highest faculties of judgment, memory, etc., are attacked first, then unconsciousness gradually sets in. The spinal cord centres are then affected; there may be some temporary irritation, which is followed by paralysis, and then by loss of sensation and of the reflexes. The automatic centres of breathing and the heart-beat are only slightly affected. There may be some lessening of heart action, following an initial stimulation, and similar respiratory changes. The patient thus in complete anæsthesia is motionless and senseless, unable to feel or move, his automatic functions of most vital importance to life-maintenance alone functioning. It is in this stage that operations are performed, although minor operations may be performed in the early stages of primary anæsthesia.

When the administration of chloroform is pushed too far, or there is a peculiar susceptibility to its effects, as in some individuals, poisoning results. It is usually rapid in onset, is attended with cyanosis, weak, trembling pulse, and reduction of blood pressure. The vaso-motor system seems to be paralyzed, and death is due perhaps to this alone, although other factors seem to be involved at times. Following chloroform anæsthesia, nausea and vomiting are apt to occur. Chloroform is a safe anæsthetic, deaths to the proportion of 1:3,000 or 1:4,000 are said to occur; hence ether, which has a proportion of 1:16,000 is preferred by many. This is so particularly in America, whereas in Europe chloroform is preferred. See ANÆSTHETICS; ETHER.

Chlo'rophane, in mineralogy, a variety of fluorspar, or fluorite, which, when heated, shines with a green phosphorescent light. It is found at Trumbull, Conn., and in the mica mines of Amelia County, Va.

Chlorophyll, klō'rō-fīl, the green coloring matter of plants. It plays an important part in the life of the plant, as it breaks up the carbonic

CHLOROPHYLLITE — CHOATE

acid gas taken in by the stomata of the leaves into its two elements, carbon and oxygen, returning the oxygen to the air, and converting the carbon with the water obtained from the roots into starch. Light is indispensable to the formation of chlorophyll, and hence arises the etiolation or blanching of plants by privation of light, either by the art of the gardener or from accidental causes.

Chlorophyllite, klō-rō-fil'it, an alteration product of the mineral iolite (q.v.). The only difference in composition is a larger percentage of water, but there is a marked decrease in hardness, from 7 to from 1.5 to 3, and also in transparency. The characteristic blue color of iolite is changed to a dull green, while a basal cleavage is highly developed. Its specific gravity is 2.7. It is found at Unity, Me.

Chloro'sis, an anæmia occurring in young girls about the period of puberty and characterized by a low percentage of hemoglobin in the blood. It is common in blondes, and in ill-fed and house-confined individuals. The chief symptoms are sickly greenish pallor, hence the name green-sickness, marked debility, breathlessness, palpitation, and tendency to fainting. There is frequently mental depression, irritability, and often perversion of the appetite. The most characteristic changes are in the blood. Here the number of red cells may be normal or slightly diminished, but the percentage of hemoglobin is reduced one half or even more. There is no marked leucocytosis. Gastro-intestinal symptoms may be present. Constipation is the rule. There may be anæmic heart murmurs; the pulse is soft and full; and in many cases there is a low persistent fever. Headaches, neuralgias, and cold hands and feet are prevalent. The treatment is by means of open air, exercise, iron, arsenic, full diet, and pleasant occupation.

Chlorosis is also one of the most formidable diseases to which plants are liable, often admitting of no remedy. It consists in a pallid condition of the plant, in which the tissues are weak and unable to contend against severe changes, and the cells are more or less destitute of chlorophyll. It is distinct from blanching, because it may exist in plants exposed to direct light on a south border, but is often produced or aggravated by cold, ungenial weather and bad drainage. The most promising remedy is watering them with a very weak solution of sulphate of iron. Many forms of the disease exist, of which those of clover, onions, cucumbers, and melons are best known.

Chlorostoma, in zoology, a genus of *Mollusca* of the family *Throcidæ*. The shell is deeply umbilicated almost to the top of the spire; the inner lip forms a semi-margin to the umbilicus, while the outer lip is angulated at the base.

Chlorotylum, a plant belonging to the genus *Confervoid Alga*, of the family *Chatophoraceæ*. The filaments are jointed, are repeatedly dichotomous, and parallel; the joints are of two kinds, some being elongated and colorless, while others are swollen, abbreviated, and have green endochrones.

Chloroxylon (Greek, *χλωρός*, green and *ξύλον*, wood), a genus of plants of the order *Cadrelaceæ* (q.v.), generically differing in the fact that the fruit has only three cells and is

split into three instead of five parts. The satin-wood tree of India, *Chloroxylon Swietenia*, sometimes grows to a height of 50 or 60 feet, and is a native of Ceylon and the Coromandel coast. The wood is hard and light-colored, having a satin-like lustre, and is sometimes mottled or curled, somewhat resembling box-wood but deeper in color. It is mainly used for articles of turnery, for the backs of brushes and often as veneering for cabinet-work.

Chmelnizkij, Nikolaj Ivanovich, nē'ko-lī ē-vān'ō-vīch чмѣл-нїт'скѣ, Russian writer: b. 1789; d. 1846. He contributed largely to the reformation and elevation of the Russian stage. Among his comedies are: 'The Babblers'; 'Air Castles'; 'The Waverer.'

Chmielnicki, чмѣ-ѣл-нїт'скѣ, **Bogdan**, Cossack chief: b. 1593; d. 25 Aug. 1657. He was the son of a Polish nobleman, who settled among the Cossacks of the Ukraine. This people, who had long defended the eastern boundaries of Poland against the Tartars and Russians, were at that time subjected to grievous oppression. Their religion was persecuted, their freedom circumscribed, and the castle of Kudak, called the curb of the Cossacks, was built to restrain them. Thus exasperated, they seized Kudak and massacred the garrison, but were soon subdued. After their defeat at Kumejki, Bogdan was sent to the Polish court, where he was favorably received, but suspicion soon drove him forth, and finally made him a scourge of Poland. Availing himself of the hatred and prejudices of the Cossacks, he entered upon a conspiracy against the Poles, and sought the alliance of the khan of the Tartars. Chmielnicki became master of the Ukraine, and carried terror, devastation, and death as far as Lemberg and Zamosc. Under the new king, John Casimir, the war was continued with equal cruelty on both sides. Chmielnicki put himself under the protection of Turkey, of Russia (1654), and again under that of Poland (1656).

Choate, Joseph Hodges, American lawyer and diplomat: b. Salem, Mass., 24 Jan. 1832. He was graduated at Harvard University in 1852, and at the Harvard Law School two years later. After practising law in Boston for a year he went to New York city, where he achieved remarkable success as a lawyer, becoming in 1884 a member of the famous legal firm of Evarts, Choate and Beaman. He won great distinction as a trial lawyer, conducting many celebrated cases in State and Federal Courts and International tribunals. He successfully defended General Fitz John Porter, prosecuted the infamous Tweed Ring, appeared in the Tilden Will contest, the Chinese Exclusion cases, the Income Tax cases of 1894, and represented the Canadian government in the Bering Sea dispute. In 1856, he became active as a republican in supporting John C. Fremont. In 1894 he was president of the New York State Constitutional Convention. In 1896 he was a candidate for United States Senator but was defeated by T. C. Platt. President McKinley appointed him in 1899 to succeed John Hay as ambassador to the court of Saint James, in which capacity he served till 1905. He was elected a "Master of the Bench of the Middle Temple" of England on 10 April 1905. This is the most distinguished honor conferrable by English lawyers on an outsider, and he is the first



JOSEPH HODGES CHOATE.

CHOATE—CHOCTAW

American so honored since the five signers of the Declaration of Independence were elected members. Mr. Choate is famous as an orator and shares with Chauncey M. Depew the title of leading humorous after-dinner speaker of this country. Consult Clemens, 'Choate Story Book' (1900).

Choate, Rufus, American lawyer: b. Essex, Mass., 1 Oct. 1799; d. Halifax, N. S., 13 July 1858. He was graduated at Dartmouth College in 1819; was admitted to the bar and began practice in Danvers in 1823; removed to Salem in 1828; and was a member of Congress in 1830-4, resigning in the latter year. Removing to Boston in 1834, he rapidly acquired a large practice. He was successor of Daniel Webster in the United States Senate in 1841-5; resuming his legal practice in Boston at the expiration of his senatorial term. He traveled in Europe in 1850, and was a delegate to the Whig National Convention in Baltimore in 1852. After Webster's death Mr. Choate was acknowledged the leader of the Massachusetts bar. He made many political speeches, the most brilliant, while a United States senator, including those on the Oregon Boundary, the Tariff, the Fiscal Bank Bill, the Smithsonian Institution, and the Annexation of Texas. His style is peculiar and characteristic, but hardly to be commended as a model for imitation; it is rich, vivid and glowing, instinct with passion, and colored with all the hues of fancy, but sometimes, it must be admitted, a little extravagant and exaggerated. The most remarkable quality, however, in his written compositions, is the structure of his periods. These are not the short and compact statements, involving but a single proposition, in which most writers of our times express their thoughts; but they recall and renew the continuous sweep and long-resounding march of the prose writers of the 16th century. They are often of breathless length, containing clause after clause, modifying, enlarging, or limiting the leading idea. His 'Addresses and Orations' appeared in a sixth edition in 1891. Consult Brown, 'Life of Rufus Choate' (1870); Neilson, 'Memories of Rufus Choate' (1884); Whipple, 'Recollections of Eminent Men' (1886).

Chocks, pieces of wood employed on ship-board as wedges to support various articles liable to be displaced by the motion of the vessel. They receive different names according to the purposes for which they are used, as "anchor-chocks" to support the anchor; "rudder-chocks" to keep the rudder immovable, in the event of accident rendering it unmanageable. Chocks are also used to support casks, boats, and other curved objects.

Choc'olate. See CACAO.

Choc'taw (properly **Cha'hta**, the chief "Chactas" in Chateaubriand's 'Atala' is an eponym of the tribe), one of the largest tribes of the great Muskogean (q.v.) stock, and before its deportation the most advanced in husbandry and general culture of any except the Creeks. They were called "Flatheads" by the French (not to be confused with the northwestern tribe of that name), from a habit of flattening their children's skulls with bags of sand; and they had a burial custom of disinterring the corpses after a few days, cleaning the bones, and preserving them. They are rather short,

stout, and slow, compared to the taller and more active Chickasaw (q.v.); and were nicknamed "tubbies," though not on that ground, but from the customary final word of their war-chiefs' names, meaning "killer." The Chickasaw was one of their subdivisions, or perhaps merely the more warlike and adventurous portion, till after the whole had crossed the Mississippi; and while using a dialectic language of their own for common service, still employed Choctaw for oratory. The Choctaw occupied central and southern Mississippi and western Alabama in three divisions, west of the Muskogee; and in the 18th century their chief towns lay in two groups, one some 200 miles north of New Orleans (about the present Choctaw County, Miss.), and the other about half way from the Chickasaw to Mobile. These villages a century earlier had been numerous and widely distributed; they are stated at 40, and the tribe as having 2,500 warriors. It was first found by De Soto in his expedition of 1540. At their town of Mavila (Mobile, probably Choctaw Bluff, Clarke County, Ala., on the north bank of the Alabama), was fought perhaps the bloodiest and most destructive single battle ever known between red and white men on the continent. The village was burned, 20 of De Soto's men killed and 150 wounded, and many hundreds of Indians slain—the Spanish chroniclers say 2,500 to 3,000, which may be discounted. Tristan de Luna met them again in 1560. The French, in settling this region about 1700, came immediately in contact with them, and established friendly relations with them, contrasting strongly with the permanent hostility of the Chickasaw, against whom and the Natchez the Choctaw aided the French. The latter planted forts in their country, and sent missionaries among them. In the final struggle between France and England, however, the English won over a part of them, including the chief Red Shoes. After the Revolution, the Choctaw shared with the other Indians in the general treaty of Hopewell 28 Nov. 1785, by which the sovereignty of the United States was recognized, a portion of the Choctaw lands ceded, and they were "guaranteed" the possession of the rest. By 1800 some 500 of them had migrated to the Arkansas (Indian Territory), and it is said that the rest were much less unwilling to go than the Cherokees and Creeks. They did good service to the Americans in the Creek war 1813-14. In 1820, by the treaty of Doak's Stand, they ceded part of their lands for an equivalent amount on the Arkansas; and in 1830, by that of Dancing Rabbit Creek, they gave up the rest—19,000,000 acres, or nearly 30,000 square miles, in the two cessions, for 20,000,000 acres in Indian Territory and \$2,225,000 in money and goods. In 1837 they removed with the Chickasaw to their new lands, between the Arkansas and Canadian rivers on the north and the Red River on the south. How the Chickasaw first amalgamated with and then separated from them is told under CHICKASAW. They made good progress, received the missionaries of the American board and several Church denominations, were given a well-diffused school system, and established a government consisting of a head chief, a council of 40 chiefs, a two-chambered legislature, and a regular judiciary system with trial by jury. Like all the southern tribes, they were slaveholders, and in 1860 had some 5,000 negro

slaves. Their superintendent and agents were Southerners, and they joined the Confederate side in the Civil War. Though their land was not overrun, their progress was brought to a standstill, and their population reduced by a third; and after the War, they were for a time deprived of their rights. On being restored, they had to part with a section of their lands to the government, which settled other tribes there. For a time, a territorial government was formed, with the superintendent as governor; and they had to make heavy allowances to their emancipated slaves. In 1900 there were 10,321 Choctaws proper in the Territory, besides those who had taken up lands in severalty; and some hundreds still remaining in Mississippi. A grammar of their difficult language was published in 1870.

Choczim, *hō'tsīm* (properly **Khotin**), Russia, a fortified town, on the right bank of the Dniester, opposite to Kaminiec, in Bessarabia. In 1718 the Turks caused it to be regularly fortified by French engineers; but it was taken by the Russians in 1730, 1769, and 1788. As it is completely commanded by the hills which surround it, its value as a fortress is now small. Its chief importance is as a military station. Pop. 16,000.

Chodat, *shō-dä*, R., Swiss botanist: b. Moutier-Grandval, Jura-bernois, 6 April 1865. In 1889 he became a professor of botany in Geneva University and has been *doyen* of the Faculté des Sciences there, from 1898. He has contributed numerous professional papers to botanical journals, and has published many important monographs.

Chodkiewicz, *hōd-kē-ā'vich*, **Jan Karol**, Polish general: b. Lithuania 1560; d. Chocim 27 Sept. 1621. He served against the Cossacks, defeated Charles IX. of Sweden in 1605, and afterward served against the Russians and the Turks.

Chodowiecki, *hō-dō-vē-ěts'kē*, **Daniel Nicolaus**, German designer and engraver: b. Dantzic 16 Oct. 1726; d. Berlin 7 Feb. 1801. He was instructed in miniature painting by his father, and subsequently painted snuff boxes. He was encouraged to study enameling, and soon attracted attention by the beauty and finish of his productions, some of which came under the notice of the academy of Berlin, and procured him a commission to make a set of designs for their almanac. The manner in which he executed these established his reputation. He thenceforth devoted himself almost exclusively to designing and engraving; he produced the plates for Klopstock's 'Messiah,' 'Don Quixote,' Lavater's 'Physiognomy,' editions of Shakespeare, Voltaire, La Fontaine, and many other works.

Chodzko, *kōdz'kō*, **Jacob Leonard**, Polish scholar: b. Oborek 6 Nov. 1800; d. 1871. Having traveled as secretary of Prince Oginski through nearly all Europe, he established himself in 1826 at Paris, where he published a memoir of the prince, with an introduction entitled 'Observations sur la Pologne et les Polonais' (Paris 1827), and commenced collecting materials for a history of his country from the death of Augustus III. Afterward he published the 'History of the Polish Legions in Italy, Under the Command of Gen. Dombrowski' (1829). During the revolution of July

1830, Lafayette appointed him his aide-de-camp; and after the outbreak of 29 November of the same year in Warsaw, he acted as agent of the revolutionary government in France. He was an active member of the French-Polish and American-Polish committees, and after the failure of the revolution, as member of the national Polish committee of France.

Chœnix, *kē nīks*, a measure of capacity among the ancient Greeks. Its size is variously given, and it is probable that it actually differed in the different states of Greece. Some accounts represent it as containing three cotylæ, or about 1.487 pints English; others make it equal to 1.982 pints; and still others give it as equal to 3.964 pints.

Chœrilus, *kē'rī-lūs*, the name of several Greek poets, among whom Chœrilus of Samos is the best known. He lived in the 5th century B.C., was the contemporary and friend of Herodotus, and composed an epic poem, entitled 'Perseis,' celebrating the victory of the Greeks over Xerxes. The fragments of the poem still extant have been collected and explained by Näke (Leipsic 1817). Another Chœrilus, of Iasus, in Caria, is mentioned by Horace as an example of an extremely bad poet. He formed part of the train of literary men who were selected to accompany Alexander the Great on his expedition to the East.

Choir. 1. In religious worship, an organized body of singers. In ceremonial Christian religions, and more particularly in the ordering of services in the Church of England, the minor canons, vicars choral, and choristers, or other singers taken collectively, are spoken of as the choir. The choral body in the latter Church is usually divided into two sets of voices, the one sitting on the north and the other on the south side of the chancel, and are known by the respective titles of Cantoris and Decani from their nearness to the Cantor (or Precentor) and to the Decanus (or Dean). In most cathedrals and collegiate chapels, the Decani side is held to be the side of honor, the best voices are placed there, and all the verses or soli parts, if not otherwise directed, are sung by that side, which is also considered the "first choir" (*coro primo*) in eighth-part music. 2. In architecture, the eastern limb of a cruciform church or the eastern portion of any church. In the latter case it is more commonly styled the chancel (*q.v.*), and is frequently constructionally lower and narrower than the main part of the building. The ordinary daily services in a cathedral or collegiate church are held in the choir. While architecturally the term choir is applied to the entire portion of the church east of the crossing, the eastern limb is itself divided into three portions: (1) the "ritual choir," containing the stalls for the singers and comprising the western portion of the architectural choir; (2) the presbytery, next east of this, containing seats for the laity (a term sometimes applied to all of the choir east of the "ritual choir"); (3) the sanctuary, containing the altar and sedilia, and divided from the remainder by a low railing. In certain cases there is even a fourth division called the retro-choir, comprising one or more bays east of the sanctuary. These are sometimes, as at Lincoln, Truro, and York, of the same roof elevation as the rest of the choir, but more commonly parts of a lower

CHOIR INVISIBLE — CHOKE-CHERRY

structure, as at Hereford, Winchester, and Salisbury. It should be noted that the "ritual choir," or place for the singers, does not invariably correspond with the architectural choir. Sometimes, as Winchester, Norwich, and Gloucester cathedrals, it includes the crossing and one or more bays of the nave, or again, as at Westminster Abbey, and in Spanish cathedrals generally, it is entirely in the nave, from the remaining portion of which it is separated by a massive wall or screen. In buildings where the ritual choir is entirely east of the crossing, the choir screen is placed between the eastern piers of the crossing. At Gloucester, Exeter, Lincoln, York, Southwell, and several other cathedrals, the organ is placed upon the choir screen. In several English cathedrals the choir is quite as long as the nave, and in some parish churches even longer, but the usual proportion of choir to nave is as one to three. In French churches the choir frequently terminates polygonally with encircling chapels and this termination is known as a chevet, but in England the square east end is the most common in Gothic churches, although in Norman ones the semi-circular apse is not infrequent. In the Middle Ages, the choir, as the most indispensable portion of the church, was erected first, the nave, regarded practically as a stately approach to the choir, was built later, a century or more sometimes intervening between the completion of the choir and that of the nave. At the present time the cathedral of Saint John the Divine in New York is being erected after the mediæval custom, the intention being to wait for some years after the completion of the choir before beginning work upon the nave.

Choir Invisible, The, a novel by James Lane Allen, published in 1897. It is one of his most popular and pleasing stories, and was enlarged from an earlier story called 'John Gray.' Its scene is the Kentucky of 100 years ago, and the fresh picturesque descriptions of pioneer life in Kentucky give the tale historical value.

Choiseul-Amboise, Étienne François, ā'tē-en frāñ swā shwā-zēl-āñ-bwāz, DUC DE, French statesman: b. 28 June 1719; d. Paris 7 May 1785. He entered the army in early life, and after distinguishing himself on various occasions in the Austrian War of Succession, returned to Paris, where his marriage with the daughter of the financier, Crozat, gave him the command of great wealth, and his intimacy with Madame de Pompadour furnished the means of gratifying his ambition. After having been ambassador at Rome, where he obtained from the Pope, Benedict XIV., the celebrated encyclical letter intended to appease the disputes which had arisen on the bull Unigenitus, and at Vienna, where he concluded with Maria Theresa the treaty of alliance against Prussia, he became in 1758 minister of foreign affairs. At the same time he was made a duke. He succeeded the marshal of Belle-Isle as minister of war in 1761, and the same year he became also minister of marine. His administration was distinguished by many useful reforms. He reorganized the army and navy, which the disasters of previous wars and the neglect of previous administrations had suffered to fall into decay; negotiated the famous Family Compact which reunited the various members of the Bourbon family, and restored Corsica to France.

His fall was brought about in 1770 by a court intrigue, supported by Madame du Barry, the new favorite of the king. He was recalled to court on the accession of Louis XVI. in 1774, but not again intrusted with power.

Choiseul-Gouffier, goo-fē-ā, Marie Gabriel Florent Auguste de, COUNT OF, French antiquarian: b. Paris 27 Sept. 1752; d. Aix-la-Chapelle 20 June 1817. He early displayed a particular interest in everything relating to Greece. His wish to visit this country was gratified in 1776, and in 1782 appeared the first volume of 'Voyage Pittoresque en Grèce,' which attracted much attention and procured him a seat in the French Academy in 1784. The two other volumes appeared in 1809 and 1820. The first was entirely revised by him before his death. The same year he was appointed ambassador to Constantinople, where he remained till 1791. The appointment of ambassador to London was then offered to him, but he remained at Constantinople and sent his official correspondence to the exiled French princes. This correspondence having fallen into the hands of the republicans the convention gave orders for his arrest, but he escaped by taking refuge in St. Petersburg, where Paul I. made him a privy-councilor, director of the Academy of Arts, and superintendent of the imperial libraries. He returned to France in 1802 and resumed his seat in the Academy. In 1814 he was made a peer of the realm. His antiquarian researches were chiefly inserted in the memoirs of the National Institute, and his very valuable collection of antiquities is now in the museum of the Louvre.

Choiseul-Praslin, prä-lāñ, Eugène Antoine (è zhāñ āñ twāñ) **Horace de**, French statesman: b. 23 Feb. 1837. He was first elected to the National Assembly in 1871, and has been several times a member of the chamber of deputies. He is considered one of the leaders of the Republicans. In 1871 he was minister plenipotentiary to Italy; in 1880 he became secretary of state in the ministry of foreign affairs; and in 1887 was sent on a botanical expedition to Ceylon and the United States.

Choisy-le-Roi, shwā-zē-lè-rwā, or Choisy-sur-Seine, France, a town in the department of Seine, seven miles south of Paris, on the left bank of the Seine. Its broad, straight streets, elegant houses, and fine avenues, with the proximity of the Seine, contribute to render it one of the most agreeable towns in the vicinity of Paris. In its cemetery is the tomb of Rouget de l'Isle, author of the 'Marseillaise.' It has manufactures of wax cloth, soap, chemical stuffs, glass, morocco leather, earthen-ware, porcelain, and vinegar, and some trade in wine, vinegar, coal, etc. Pop. 11,281.

Choke-cherry (*Prunus virginia*), so called from the astringent nature of the fruit, a shrub from 2 to 10 feet high, rarely a small tree, belonging to the natural order *Drupaceæ*. For commercial uses the wild black cherry (*Prunus serotina*), which is closely allied to *P. virginiana*, is valuable. Its wood is one of the best American woods for cabinet-making. The bark has medicinal properties as a pectoral tonic, and febrifuge. The range of choke-cherry is wide, flourishing along river banks and in rocky situations, from Canada to Florida, and west to Colorado and Texas.

CHOKE-DAMP — CHOLERA

Choke-damp, the name given by miners to the fire-damp resulting from an explosion of gas in mines. The following diagram is illustrative of the combustion of fire-damp, or carburetted hydrogen, of which the product is choke-damp, called also after-damp and black-damp:

Before Combustion. <i>Wght.</i>	Elementary Mixture. <i>Atoms.</i>	<i>Wght.</i>	Products of Combustion. <i>Wght.</i>
8 carburetted hydrogen...	{ 1 carbon 1 hydrogen 1 hydrogen	6 1 1	22 carbonic acid. 9 steam. 9 steam.
144 atmosph'ic air.....	{ 1 oxygen 1 oxygen 1 oxygen 8 nitrogen	8 8 8 8 112	112 uncombin'd nit
152		152	152 choke-damp.

Choking, a stoppage caused by a morsel of food, a drop of liquid, etc., passing into the larynx or upper opening of the windpipe, instead of the gullet, or an obstruction of the œsophagus itself. It is usually followed by a violent fit of coughing which lasts, in slight cases, till the offending substance is expelled. Sometimes, however, a larger mass—for example, a half-chewed piece of meat—is drawn into the opening of the windpipe, completely blocking it, and arresting respiration altogether. This condition is one of extreme danger; the sufferer becomes purple in the face, and if not at once relieved will certainly and quickly die of suffocation. The obstructing substance is usually within reach, and may often be dislodged if a by-stander promptly pushes his forefinger to the back of the throat and attempts to draw the obstruction forward. A child may sometimes be saved by holding it up by the heels and shaking it, or slapping its back. If these measures fail relief may be obtained by means of a sharp-pointed knife promptly pushed into the windpipe to admit air to it below the obstruction. In the case of an animal, remove the obstruction with the hand when possible. Cause the animal to swallow the obstructing substance, if possible, by giving it water, oil or belladonna solution. Carefully push the obstruction down by a probang, if it is possible to effect this, and if withdrawal by the mouth is impracticable. In some cases the gullet has to be cut into by a surgeon.

Cholagogue, kōl'a-gōg, a remedy that increases the flow of bile, as distinguished from an hepatic stimulant, which increases the production of bile. Most of the cathartics that stimulate peristalsis affect the gall bladder, causing it to empty itself more energetically. These may be classed in general as cholagogues. See CATHARTICS.

Cholera, kōl'ér-a, an acute, infectious disease, endemic in some localities and epidemic in others, characterized by vomiting and purging of a peculiar rice-water-like fluid, and a stage of collapse.

Etiology.—The prime cause of cholera is one of the most perplexing questions with which scientists have had to deal, and even at this advanced period of scientific investigation it is not definitely known. The claim that it is caused by a germ is not accepted by all. Disease germs, which, according to their form, are known as cocci, bacteria, bacilli, vibriones, and

spirilla, are among the smallest units of life; 30,000,000 of them, according to Prof. Max von Pettenkofer, of Munich, weighing only one milligram. In 1884 Dr. Koch claimed that the comma-shaped bacillus was the true cause of the disease, and this theory seems to have met with considerable favor, though it is not yet admitted as a scientific truth. In fact Dr. Koch himself, in an address delivered before the Imperial German Board of Health at Berlin, 30 Aug. 1884, admits that the true cause of cholera is not precisely known, though he invariably found it to exist. Dr. H. Vandyke Carter of London says that the real cholera germ, if such a thing truly exists, has yet to be found. He, too, says he found an organism resembling a vibrio rather than a bacillus, and this he did not find in all cases. He also claims that it would be irrational to suppose that an everywhere widely distributed organism like *Vibrio frugula* can alone be the essential cause of Asiatic cholera. His investigations were all in India, and he did not see an authentic specimen of this organism. Others assert that it is a specific disease originating in India, and the assertion is also made that cholera can arise spontaneously in other countries and is not dependent on a specific cause.

Dr. Koch says that the comma bacilli grow extremely rapidly and reach a maximum in two days; after that they commence to die, and other bacteria form in their place. Temperature has very little to do with their lives, however. They are said to live at temperatures ranging from -15° to 104° F. These bacilli are located solely in the intestines, as, according to Dr. Koch, none have been found to exist in the blood or in any of the other organs. In the lower section of the lower intestines they are found in greatest abundance, also in the dejecta, but not often in the vomit. It is said that the bacilli cannot live in the stomach, and the reason that most deaths occur on Monday and Tuesday is because those days succeed the one in which over-eating and -drinking is usually indulged in, and the bacillus is conveyed into the intestines by the undigested mass of food that passes into them.

How Bacteria Kill.—The question then arises, How is it that this bacterial vegetation in the intestines can kill a man? Bacteria not only consume substances, but also produce others of various kinds, many of which are of a very peculiar nature. Some are of a transient nature and emit an intense smell; others produce coloring matter or some poisonous substance. In the putrefaction of albuminous liquids blood poisons are formed which must be products of vital changes of these bacteria, as putrefaction is only a consequence of bacterial vegetation.

It is asserted that these comma bacilli destroy the blood corpuscles within a pretty wide range, and it is fair to conclude that they also destroy more or less of the surrounding tissues. Mr. Richards, a physician at Goalundo, in India, says that sometimes one can feed the dejecta to animals and do no harm; at other times the dejecta prove fatal and the animals die in cramps. The time required for such animals to die after eating the dejecta is from 15 minutes to two and a half hours.

This reasoning does not go to show that these animals die from a species of bacteria, but

CHOLERA INFANTUM — CHOLET

from a poison of some peculiar nature generated from the cholera dejecta, and why this action does not occur in all cases is more than can be explained, unless it is influenced by the contents of the stomach. Some pathologists claim that death is produced by paralysis; others say by mortification of the epithelium and mucous membrane; and again it is said to be due to inspissation of the blood, produced by loss of water. It would seem, however, that death is caused, in many cases at least, by irritation of the nerve centres, and consequently by some peculiar brain lesion.

Dr. Koch concludes that the only way known at present to get rid of the infectious matter of cholera is to dry it, and thus kill the germ. A more important matter, granting the comma bacillus to be the true cause of cholera, would seem to be to learn how to dispose of it in the human stomach before it goes farther and terminates life, which it must surely do when it enters the intestine.

Cholera originated in the East Indies and was not known to migrate for 1,000 years. The oldest Sanskrit writings show that it was known many hundred years before the birth of Christ. In the 17th and 18th centuries there are abundant proofs of epidemics, but it did not spread into Europe until 1830. The Russians took it from India through couriers and stage-coaches. Another peculiarity of this disease is that when it was in Marseilles it broke out in Paris, jumping Lyons, the second largest town in France, notwithstanding the fact that quarantines were in full force.

A Miasmatic Disease.—The cholera germ, like the malaria bacillus, depends greatly upon a moist soil, and if it does not depend upon this, and is not a miasmatic disease, how can it be explained that in India, the home of cholera, it seldom, if ever, occurs on the mountain-tops, proving conclusively that it at least often occurs as a miasmatic disease and may be wholly independent of human intercourse. It must be remembered that in India the inhabitants drink the same water that they wash in, and, as a rule, are exceedingly careless, so it is easy to believe that cleanliness has a great influence in preventing the disease.

'The Lancet' of 15 Jan. 1885 says that a special commission was sent out from England to India to inquire into the cause of cholera, with particular reference to the theory of Prof. Koch that the comma bacillus is the true seed of the disease. The commissioners were Dr. E. Klein and Dr. Heneage Gibbs, both medical men of distinction and accomplished in physiological research. The result of their labors in the very home of cholera is tersely stated by Dr. J. N. Cunningham, the Sanitary Commissioner of the government of British India, when he says that their conclusions "are altogether subversive of the statements advanced by Prof. Koch as to the so-called comma bacillus being the cause of cholera."

Pathological Anatomy of Cholera.—After death the stomach contains more or less of the whey-like albuminous fluid and is full of cast-off epithelium. The small intestines usually contain a large quantity of the whey-like fluid and epithelium. The glands of Brunner, the solitary and agminated patches, are thickened and very prominent. The solitary glands of the large intestines are also infiltrated and swollen.

The liver is more or less advanced in fatty degeneration. The kidneys have a pale, white appearance, due to the epithelium blocking the tubes. The bladder is empty and contracted. The lungs are congested. The right cavities of the heart are distended with blood, while the left cavities are empty and contracted.

Cholera is usually ushered in by vomiting, purging, and griping pains in the stomach, and death follows in from 1 to 24 hours. If life is retained longer than this time the patient may possibly recover. A large percentage of the cases die.

Treatment.—Opium, quinine, whiskey, sulphuric acid, camphor, chloroform, chlorodyne, carbolic acid, bismuth, hydrocyanic acid, chloral, and atropia are the favorite remedies. Brown Sequard says the most efficient remedy is the hypodermic injection of morphia with atropia. He, too, says this treatment will prevent an attack of cholera.

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Cholera Infan'tum, an acute infectious disease of infants, due in large part to a definite micro-organism, the *Bacillus shiga*, or allied species, characterized by acute gastro-enteric inflammation, with nausea, vomiting, diarrhœa, temperature, wasting, and prostration. Death may result in a very short time. The child may be attacked suddenly, but it is more liable to occur in children who have been somewhat run down from a mild diarrhœa of indigestion. The child is then taken with the cholera-like diarrhœa, passing thin serous- or rice-water discharges, 10 to 20 a day. The temperature rises abruptly to from 103° to 105° F. and there is constant vomiting. There is rapid emaciation and prostration, the child having strength only to moan or cry with a sharp irritable sound. Dullness, stupor, and at times convulsions precede death. Treatment should be prompt and requires skilled medical attendance. Acute summer diarrhœa of infants is not necessarily cholera infantum. In fact cholera infantum is not a common disease, whereas the acute diarrhœas of children, resulting from tainted foodstuffs, is very common. Every case of summer diarrhœa, however, should receive vigorous treatment, because it offers an opportunity for the *Bacillus shiga* to develop cholera infantum.

Cholesterin, kō les'tēr-īn (C₂₆H₄₄O), a substance found in bile, blood, etc., which may be obtained in the form of beautiful pearly crystalline scales, without taste or odor. It is widely distributed in the animal economy, being essential to the brain and nerve substance, and having been found in milk and many portions of the body, both as a normal and as a pathological constituent. Cholesterin was first obtained by Conradi, in 1755, from human gall-stones, in which it is often present in large quantities. It melts at 297° F. It is the chief constituent of lanolin (q.v.), a highly important oily substance that is obtained from the grease of sheep's wool.

Cholet, shō-lā, France, a town in the department of Maine-et-Loire, on the right bank of the Moine, 32 miles southwest of Angers. It has a tribunal of commerce, consulting chamber of manufactures, and communal college. Its manufactures include handkerchiefs and cotton goods, called *cholettes*, flannels, and woolen

CHOLIAMBUS — CHONDROPTERYGII

stuffs. There are also wool and cotton spinning-mills, bleachfields, dyeworks, and tanneries. There is also a great trade in cattle, the markets for which are attended by a large concourse of buyers from other parts. Pop. 15,000.

Choliambus, kō-lī-ām'būs (Greek, *choliambos*, the lame iambus; also called *skazon*, from *skazo*, to halt; or *versus Hipponacticus*, because the satirist Hipponax of Ephesus made use of it, or perhaps invented it), an iambic trimeter, the last foot of which, instead of being an iambus, is a trochee or spondee, which gives it a lame motion, as, for instance, Martial, l. i. pray. v. 3.

Cur in theatrum, Cato severe, venisti?
An ideo tantum veneras, ut exires?

We perceive, from the construction of the choliambus, that it may be applied with advantage to produce a comic effect. The Germans have happily imitated this verse, as well as all other ancient metres. An instance of a German choliambus is —

Der Choliambe scheint ein Vers für Kunstrichter.

Cholic (kōl'ik) **Acid** (C₂₄H₄₀O₅), a non-nitrogenous acid produced by decomposing the true biliary acids with an alkali. It does not exist in bile ready formed. It is crystalline, sparingly soluble in water, but readily soluble in alcohol and ether. The cholates are rather obscurely crystalline; they are not very soluble in water, but rather more so in spirit. Both the acid and salts have a bitter taste.

Choline, kōl'in, a basic body found in both plants and animals. In animals it is apparently one of the reduction compounds of proteids, being a trimethyl oxyethyl ammonium hydroxide. It is of interest in medicine chiefly because of its close affinities to two very poisonous compounds, into either of which it may be converted. By oxidation it builds neurine, a highly poisonous body; and by hydration it becomes an alkaloid-like body closely resembling the plant alkaloid muscarine, from the poisonous mushroom *Amanita muscaria*. Thus choline may be one of the auto-intoxicating substances that may be developed in the human body if its normal metabolism is disturbed. It may also be a factor in the so-called ptomaine poisoning.

Cholmondeley, chūm'li, **Mary**, English novelist. Her fictions have been extremely popular and include 'The Danvers Jewels'; 'Sir Charles Danvers'; 'Diana Tempest'; 'A Devotee'; 'Red Pottage'; 'Love In Extremis.'

Cholochrome, kōl'ō-krōm, or **Cholophæin**, the brown coloring matter contained in bile and in the intestines, and the substance coloring the fæces and the skin in jaundice.

Cholophæin, kōl'ō-fē'in. See CHOLOCHROME.

Cholos, shō'lōz, in Peru, the name for those who are partly of white, partly of Indian parentage, the most numerous class of the community.

Cholula, chō-loo'lä, Mexico, a city in the state of Puebla. It is 12 miles west of La Puebla, 60 miles southeast of the city of Mexico. The streets are regular and spacious, the houses mostly of one story, and flat-roofed. Though fallen from the importance it had attained in the early part of the 16th century,

it still exhibits traces of its former greatness. Under the name of Chunultecol it was once the capital of an independent district, and the seat of the religion of the ancient Mexicans. It was the great centre of the Aztec worship. At that time it contained, it is said, 40,000 houses and more than 400 temples; one of these temples still remains, though in ruins. It is described by Humboldt as being built in the form of a pyramid, of four stories of equal height, in alternate layers of clay and sun-burned bricks; each side of its base measuring 1,440 feet, and its height in all 164 feet. At the present day it is so altered that it looks at a distance like a natural hill. On one of its highest platforms a chapel has been constructed, in the form of a cross, 90 feet long, with two towers and a cupola. Since the introduction of Christianity, this and other of its temples have been used for Christian worship. Pop. 10,000.

Chondrine, kōn'drīn, a substance containing carbon, hydrogen, nitrogen, oxygen, and sulphur, obtained from rib-cartilage by continuous boiling with water, exhausting with ether to remove fat, and drying. Its composition varies slightly according to the material made use of; it contains about 0.4 per cent of sulphur. It is a diaphanous horny mass, insoluble in alcohol, but softening and dissolving in hot water. From this solution it is thrown down as a bulky precipitate by acids, and by the salts of several heavy metals. By boiling with sulphuric acid it is decomposed into leucine, and with hydrochloric acid into a sugar-like body called chondroglycose. Nothing definite is known about its origin or function in the body. It has a marked general resemblance to gelatine, but it is distinguished by giving the precipitates just mentioned with the acids and salts. Infusion of nut-galls precipitates both.

Chondro'ma. See TUMORS.

Chon'dro-sarco'ma. See TUMORS.

Chondropterygii, kōn-drōp-tēr-ij'ē-ī. Under this name were included by Cuvier the sturgeons, sharks, rays, lampreys, mud-fish, and lancelet, an assemblage of fishes so unnatural that the possession of fins and gills sums up nearly all they have in common. The term was adopted to give prominence to what seemed a fact of cardinal importance, namely, that the skeleton of the limbs was cartilaginous. In modern systems the *Amphioxus*, or lancelet, is the sole example of an order — *Leptocardii* (Müller) or *Pharyngobranchii* (Huxley) — in which the cranium is purely membranous and scarcely larger than the spinal canal; the spinal marrow is enclosed in a sheath, with only traces of division into vertebræ; and a heart is wanting, the circulation being maintained by the contractility of the blood-vessels. The glutinous hag (*Myxine*), the river lamprey (*Petromyzon*) and its larva (*Ammocætes branchialis*), represent the order *Cyclostomata*, known also as *Marsipobranchii*, the gills being lodged in pouches. These two groups should, in the opinion of some, form two distinct classes of equal value with the remainder of the fishes, which are divided into the ganoids, or *Ganoidei*; the osseous fishes, or *Teleostei*; the *Selachii*, including the sharks and rays; and the *Dipnoi*, represented by the mud-fish (*Lepidosiren*). The last-named group comes under the *Chondrop-*

CHONDROSTEI — CHOPIN

terygii of Cuvier, but it is now known to rank very high in the scale among fishes, and to be closely related to the amphibians or to the reptiles, inasmuch as its heart has two auricles, the other fishes having only one, and true lungs co-exist with gills. Again, while the skeleton of the sturgeon is nearly wholly cartilaginous, that of the other ganoids is well ossified, while the structure of the heart and sense organs removes the *Selachii* very far from the lancelet and the cyclostomatous fishes. The cartilaginous or embryonic condition of the skeleton may persist through life among the fishes in association with the highest as well as the lowest development in other respects. The Cuvierian group is therefore now distributed according to the sum of the characters, and the fishes included in it are not massed together simply because one point of structure is common to all.

Chondrostei, kŏn-drŏs-tē-i, an order of bony fishes of lowly and degenerate organization, formerly classed as cartilaginous ganoids. The internal skeleton is but little ossified, the vertebræ and most of the skull remaining in a stage of pure cartilage; but the skull is enclosed by close-fitting dermal bony plates, which are peculiar in having a median in addition to paired series. The notochord is largely persistent. The mouth is small, and ventral in position; and the jaws very weak and toothless, or provided with minute teeth. In the gill-cover the opercular bones are reduced in number, and the branchiostegal rays absent or wanting. There are no true scales, but a small number of longitudinal rows of large bony plates, with granules on the intervening skin. The intestine is provided, as in the sharks, with a spiral valve. The elongated snout, stout body, large fins, and strongly heterocercal tail complete the aspect of these survivors of a once dominant race. There are two families, the *Acipenseridæ*, or sturgeons (q.v.), and the *Polyodontidæ*, or paddle-fishes (q.v.).

Chondrus, kŏn'drŭs, the genus of seaweeds to which carrageen or Irish moss belongs.

Chonos (chŏ'nŏs) **Archipelago**, or **Guaytecas Islands**, a group of islands belonging to the Chilean province of Chiloe, lying off the west coast of Patagonia, mostly between lats. 44° and 46° S., and lon. 74° and 75° W. Two are large, but they are all barren and scantily inhabited. Magdalena is the largest island.

Chop-sticks (Chinese, *kwai-tsz*, "nimble or diligent lads"), two smooth sticks, about the thickness of a quill, of bamboo, wood, or ivory, which are used by the Chinese for conveying meat or vegetables, particularly rice, to the mouth. The chop-sticks are used in various manners, serving partially the purposes of a fork and a spoon. The most curious mode of using the chop-sticks is when a bowl of rice is brought close to the lips, the mouth held wide open, and the grain dexterously dashed into it with the chop-sticks, held one on each side of the forefinger, and plied with a rapid motion quite suggestive of the Chinese title.

Chopin (François), Frédéric, Polish pianist and composer: b. Zelazowa Wola (near Warsaw), 1 March 1809; d. Paris, 17 Oct. 1849. Chopin, in the words of Saint-Saëns, "revolu-

tionized the divine art and paved the way for all modern music"—certainly for all pianoforte music. His father, Nicholas Chopin, was born in 1770, at Nancy, Lorraine, and emigrated to Warsaw, in 1787, where he was at first a bookkeeper, and subsequently a professor of French in the Lyceum. He was reputed to have Polish blood in his veins, and, in 1806, he married a Polish girl, Justina Krzyzanowska, the daughter of "poor but noble parents," who bore him three girls beside Frédéric, who inherited from her the intense love of his native country and its art, which is one of his most striking characteristics. He got his first lessons on the pianoforte from a Bohemian composer named Zywyny, and made such rapid progress that he was able to play a concerto in public before he was 9 years old. Three years later he entered the Lyceum and also took lessons in counterpoint and harmony of the head of the Warsaw Conservatory, Joseph Elsner, who, while teaching him the value of hard work, had sense enough to recognize his genius and to allow his striking individuality free play. While a student at the Lyceum, he wrote a one-act comedy with his sister, and otherwise showed such an interest in the stage that it seems strange he did not, in subsequent years, write an opera. (A few years ago an Italian composer tried—with little success, of course—to atone for this omission by composing an opera with melodies borrowed from Chopin's works.)

The earliest compositions of Chopin were national dances (mazurkas, polonaises, waltzes, a krakowiak, etc.) Some of these were played at the public concerts he gave at Vienna, in August, 1829, and again the following year, on which occasions the critics put their fingers on some of the most marked peculiarities of his style—the unconventional accents in his phrasing, and the "melancholy tints in the style of his shading." In March 1830, having made up his mind to visit Paris and London, he gave a farewell concert at Warsaw, which was so successful that two more had to be given. In November, he became a traveling virtuoso, visiting Breslau, Dresden, Prague, Vienna, Munich, and Stuttgart. This trip was financially a failure, and he had to write home for money to pay his fare to Paris. He was 22 years old when he reached that city, which was thenceforth to be his home. At Stuttgart he had heard of the capture of Warsaw by the Russians. There was much sympathy for unfortunate Poland in Paris, and Chopin profited by it socially. He soon became a favorite of the aristocracy, and a friend of the men and women of genius who at that time made Paris their permanent or temporary abode; Meyerbeer, Liszt, Berlioz, Mendelssohn, Heine, George Sand, the Countess L'Agoult, Cherubini, Bellini, Balzac, and others. Among these his genius found sympathetic appreciation, but the musical world in general never suspected that he was an epoch-making composer, even after he had lived in the French capital for 18 years. "He is underestimated," wrote George Sand, and Liszt said: "Whoever could read in his face could see how often he felt convinced that among all these handsome, well-dressed gentlemen, among all the perfumed, elegant ladies, not one understood him." Had his contemporaries even suspected his real greatness he might have lived in luxury from

CHOPIN

the sales of his compositions (which have since his death enriched many publishers), or from a few public concerts. As it was, his concerts grew fewer and fewer, and he had to support himself by giving lessons. As a teacher he was much in demand.

Worshipped by women, Chopin had a mind most susceptible to feminine charms. One of the young ladies he fell in love with, Constantia Gladkowska, assisted him at his farewell concert at Warsaw. She wore his engagement ring, but married another man. The adagio of the F minor concerto is an echo of his transient infatuation. In 1836 he proposed to Maria, the daughter of Count Wodzinski, but she refused him. In the following year, Liszt introduced him to the brilliant novelist, Mme. Dudevant, known to the world as George Sand. At first, Chopin did not feel attracted to her, but she knew how to overcome his coyness and ensnare his affections. A French writer says of her that 'when she was writing she would often ask Chopin to sit down by the piano and improvise, and inspired by his playing, she wrote some of her finest novels.' For a time, no doubt, her vivid imagination and her sympathy and appreciation of his music stimulated his genius, too. A romantic episode in his life is the four months he spent with George Sand and her son and daughter on the island of Majorca in quest of health. It was during this sojourn (1838) that he wrote the most marvelously inspired of his works, the Preludes, as is proved by his letters and George Sand's 'Histoire de Ma Vie.' The natives, on discovering that he was suffering from consumption, shunned him as if he had the plague, and he found it difficult to secure satisfactory lodgings. This, combined with the rainy weather, aggravated his illness. George Sand found him "a detestable invalid," whereas his pupils declared, after his death (his friendship with the novelist terminated nine years after the return from Majorca) that she had killed him by her fickleness and cruelty. He visited England in 1848, but was already so weak that he usually had to be carried upstairs. His last days were made comfortable through a gift of \$5,000 from a noble Scotchwoman and pupil of his, Miss Jane Stirling. Mozart's Requiem was sung at his funeral, and he was interred near the graves of Bellini and Cherubini in the cemetery of Père-la-Chaise.

Music is, as Rubinstein remarked, the most aristocratic of the arts, and Chopin was the most aristocratic of musicians. No other composer equals him in the elegance and polish of style, which resembles that of the best Parisian literature. This is the French side of his genius. Equally fascinating, and much more vital, is its Polish side. Chopin contributed a new national element to the world language of music (as did the Hungarian Liszt in his day, the Bohemian Dvorák and the Norwegian Grieg afterward). This Polish element characterizes all his works more or less, but particularly the songs, mazurkas, and polonaises. Of the songs there are 17; they are simple in structure, but delightfully melodious, and several of them are as realistic reflections in music of the moods of the poems as are the best songs of Germany. The mazurkas, of which there are 56, are like as many orchids; no two are alike, yet all resemble one another. They are in three-four time,

graceful, melancholy, tender. To most pianists they are music of the future; only those can properly interpret them who have mastered the Polish "zal" and the Polish "rubato." The zal is a "compound of pain, sadness, secret, rancor, revolt," such as naturally characterizes a nation with a tragic history like that of Poland. The tempo rubato is misrepresented in the biographies of Chopin, the writers of which have attached too much importance to Chopin's alleged injunction to his pupils that the left hand must keep strict time, while the right hand melody fluctuates freely. Berlioz attested, on the contrary, that Chopin "could not play strictly in time." There can be no doubt that in his playing, as in Liszt's, Rubinstein's, and Paderewski's, both hands frequently retarded and accelerated, scorning the metronomic regularity of the dance hall. The mazurkas have the *varium et mutabile*, the coquettish quality, of woman; they represent the feminine side of Chopin's genius, as do the dainty, graceful, lively waltzes (13 in number) which have been called "dances of the soul and not of the body;" and the 19 nocturnes, with their sweet melodies and dreamy, languorous harmonies. It is no longer permissible, however, to exaggerate this feminine side of Chopin's genius. The refinement of his style and the exaggerated accounts of his ill-health and feebleness (before his last illness) have distorted his image. He really had the "soul of a lion;" many of his works betray a strength, a virility, not surpassed by any other master.

To this class of his works belong his 15 polonaises, his four scherzos, four ballades, three impromptus, four fantasias, three sonatas, and most of the 27 etudes, and 25 preludes. The polonaises represent the chivalrous, martial side of Chopin's and Poland's genius. The scherzos are of marvellous originality, with a strong undercurrent of sadness—hallmark of Poland. The ballades are a creation of Chopin's genius, in form as well as in content; they are legends without words. The impromptus, also, apart from their contents, give evidence, like the ballades, the scherzos and the fantasias, of Chopin's skill in creating new patterns of musical form. The sonatas contain some of his best inspirations; they have been criticised for lack of coherence, but, as a matter of fact, there is quite as much coherence between the movements as in the sonatas of Beethoven. The etudes are infinitely more than technical studies; they include some of Chopin's most poetic pieces. The preludes Rubinstein considered the pearls of Chopin's work, and it may be asserted safely that, page for page, they contain more of the essence of musical genius than the same number of pages by any other master. Like many of the other works, they reveal Chopin as one of the three or four greatest creators of new melodies, harmonies, modulations, and rhythmic variations and combinations in the whole realm of music. He started out with what he called the "perhaps bold but noble determination to create a new epoch in art," and he succeeded. Schumann pronounced him "the boldest and proudest poetic spirit of the time" and called the G minor nocturne "a terrible declaration of war against a whole musical past." Chopin revolutionized the art of writing pianoforte pieces as thoroughly as Wagner did the method of writing operas. Liszt and all other subsequent pianists followed in his footsteps. By the use of the

CHOPIN — CHORAL

sustaining pedal to unite the tones of scattered chords he marvellously enriched the harmonic capacities of the pianoforte, and at the same time added countless new tints and shades to its color scheme. He was "the soul of the pianoforte," as Rubinstein called him, the most idiomatic of all writers for that instrument.

All of his works are for or with pianoforte. Beside those named, mention must be made of two concertos; a trio with violin and 'cello; a 'cello sonata; an introduction and polonaise for the same instrument; several fantasias and sets of variations; three ecossaises; a berceuse; a bolero; a baracole; a tarantelle; three rondos. Of the books on Chopin the best is Huneker's, which also contains analyses of all the pieces and a complete bibliography. Nieck's work in two vols. is more elaborate, but less commendable in its judgments. Liszt's book on Chopin is not always reliable, but contains valuable hints. Other books and essays are by Karasowski, Kleczynski, Janotha, Willeby, Bennett, Schucht, Niggli, Hadow, Ehlert, Lenz, Jonson, Finck. The different editions of Chopin's works are excellently discussed by Huneker; see also the essay on the 'Greater Chopin' in his 'Metzotints in Music.'

HENRY T. FINCK,

Musical Editor (New York Evening Post.)

Chopin, shō-pān, **Kate O'Flaherty**, American writer: b. St. Louis, Mo., 8 Feb. 1851; married Oscar Chopin, a New Orleans cotton factor, in 1870. Since his death she has lived in her native city. She has published 'At Fault' (1891); 'Bayou Folk' (1894); 'A Night in Acadie' (1897); 'The Awakening' (1899).

Chopin, chōp'in, a Scotch liquid measure containing two imperial pints. The chopin, in name at least, was derived from the French, with whom a similar measure was in use till the introduction of the metric system. The French *chopine* was not a uniform measure, but varied according to localities. That of Paris was a little over four fifths of an imperial pint.

Chopine, chō-pēn', an elevated shoe or clog, introduced into England from Venice in the reign of Queen Elizabeth, and which became the fashionable wear of court ladies during that reign. The Venetian chopines were made of wood covered with leather of sundry colors, white, red, yellow, and sometimes gilt. Some were of great height, the height of the chopine being regarded as a mark of the rank of the wearer. To such a degree of extravagance was this carried that women of rank could not walk without being supported. This silly fashion does not seem to have been carried to the same excess in England. Hamlet (act ii., scene 2) addresses one of the players, "Your ladyship is nearer to heaven than when I saw you last by the altitude of a chopine."

Choptank River rises in Kent County, Del., flows southwest into Maryland, and near the south extremity of Talbot County spreads into an estuary several miles wide and nearly 20 miles long, through which it empties into Chesapeake Bay; total course, 100 miles. It is navigable for sloops to the mouth of Tuckahoe River, a distance of about 50 miles.

Chopunnish, chō-pūn'ish, or **Nez Perce**, a tribe of North American Indians, also known as Nimapu, or Sahaptin, the principal tribe of the Sahaptian confederation, who now live on

the Nez Percé reservation, in Idaho, and number 1,515. The name Nez Percé originated from the custom formerly followed of piercing the nose. In the Nez Percé war the tribe was under the control of Chief Joseph, who forbade his men to interfere with any white non-combatants. See SAHAPTIAN INDIANS.

Choragic (kō-rāj'ik) **Monument**, in ancient Greece, a monument erected in honor of one who had gained a prize as "choragus," or organizer of the play and chorus. The remains of two very fine monuments of this sort are still to be seen at Athens, namely, those of Thrasyllus and of Lysicrates, the last popularly called the Lantern of Demosthenes.

Choragus, kō-rā'gūs, or **Choregus**, among the ancient Greeks, the musician who directed each of the choruses furnished by the 10 Attic tribes for the public festivals; also the citizens who defrayed the expense of each chorus. The person of the choragus was inviolable, as well as those of the members of the chorus. The choragus who was adjudged to have performed his duty best received an ornamental tripod, engraved by a skilful artist, and bearing the name of the tribe which had gained the victory, of the citizen who had paid the expense, and of the master who had trained the choir. These tripods were set up as public monuments on pillars or other structures. A street in Athens which contained a great number of such monuments was called the Street of the Tripods. The most remarkable of these monuments yet remaining is the choragic monument of Lysicrates. See CHORAGIC MONUMENT; CHORUS.

Choral or **chorale** (Ger. **choral** and **corale**). This form of melody, to which sacred songs or hymns are sung by the congregation in unison, may almost be said to belong exclusively to the German Protestant Church, this style of music having been introduced by Luther in the early part of the 16th century. These hymns were written by Luther in the vernacular, founded on the simpler tunes, and arranged to music which was more rhythmic than that in general use. This change appealed to the people and brought out the wonderful power of music to kindle religious passion. This change also had a great effect upon church music throughout Germany, and within a short time after its introduction a literature of remarkable dignity, simplicity, and earnestness was produced. During the 16th and 17th centuries many excellent examples of chorales were brought forth, probably the most important, though not the first, of the early collections being the 'Enchiridion,' or hand-book, published by Luther and his friend Walther, at Erfurt, in 1524. This book contained a preface by Luther himself, and was undoubtedly the foundation for the extensive number of collections which continued to appear till the latter part of the 17th century, but which, for many reasons, religious as well as political, shortly after that time ceased to be popular. Chorales were generally accompanied on the organ, and this custom, together with that of playing and writing so-called figured chorales, soon led to a greater development of harmony and counterpoint, so that the art of playing became of first importance to the successful singing of the chorale.

Many of the chorales were original, many

CHORAL SERVICE—CHORAL SOCIETIES

were revisions of old church tunes, and some were adapted from altogether secular sources. Of these latter, the most famous collection was that of Claude Goudimel, published in Paris in 1565, the majority of which were soon incorporated into the German collections, and one of which, 'Old Hundredth,' became very popular in England. Others taken from secular sources are 'Herr Christ der einig' Gott's Sohn,' taken from 'Ich hört ein Fräulein klagen,' and 'Herzlich thut mich verlangen,' which appears several times in Bach's 'Matthäus-Passion,' taken from 'Mein Gemuth ist Mir verwirret.' On the other hand, there are many based upon church tunes, such as 'Der Du bist drei,' taken from 'O beata lux Trinitatis,' and Mendelssohn's 'Allein Gott under Höh sei Ehr.'

The authorship of many chorales is, however, obscure and uncertain, such as the 'Es is gewisslich,' generally attributed in England to Luther. But of his authorship of the famous 'Ein' feste Burg ist unser Gott' there is but little doubt, and it has been incorporated into the compositions of Meyerbeer in 'The Huguenots,' of Mendelssohn in his 'Reformation Symphony,' of Wagner in his 'Kaiser Marsch,' and of Bach in one of his cantatas. One of Johann Crüger's chorales, 'Mon danket alle Gott,' became well known in England from its incorporation in Mendelssohn's 'Lobgesang.' See GREGORIAN CHANT.

Cho'ral Service, a service with intoned responses, and the use of music throughout wherever it is authorized. The service is said to be partly choral when only canticles, hymns, etc., are sung; wholly choral, when, in addition to these, the versicles, responses, etc., are sung.

Choral Societies. A choral society is a body of amateur singers formed for the purpose of studying and performing large choral works. Formerly all chorus singers were professional musicians, and the chorus that took part in the production of an oratorio did not usually number over 40, while the orchestra was frequently larger than this.

To-day all choral societies consist of amateurs and are much larger than their professional predecessors, while the orchestra is only slightly increased in size. An average chorus numbers 150 to 200 voices, while the orchestra varies from 35 to 60 men. It is possible that the magnificent effect of the chorus formed to celebrate the centenary of Handel's birth by performances given in Westminster Abbey and the Pantheon in London in 1784 may have been a great factor in the formation of choral societies in England. This chorus was the largest that had ever been formed up to that time. It numbered 274 and the orchestra 251. At a subsequent festival in 1791 the chorus and orchestra were said to have numbered over 1,000, while for the Handel Festival held in the Crystal Palace in London in 1874 the chorus numbered 3,200 and the orchestra over 500.

It is very doubtful, however, whether such a large body of singers and players is very materially more effective than a smaller one. The impression on first hearing an enormous chorus is nearly always one of disappointment at the volume of sound. The explanation is made that the large hall necessary for such a large chorus and audience causes a loss of quantity of tone,

but this is disproved by comparisons made at a Saengerfest held in Philadelphia, Pa. Here the effect of the entire mass chorus of 5,000 male voices was not much greater than that of a single society of 250 voices. There was a difference, of course, but the volume was not 20 times greater, not even twice as great.

A well-balanced chorus of from 200 to 500 voices is now generally acknowledged to be more effective and much easier to command than the overgrown chorus gotten together for a festival. Choruses of this size are very numerous in the United States, Germany, and England, where choral work, both religious and secular, is highly appreciated and supported; it is remarkable that France and Italy, both musical countries and more devoted to vocal than to instrumental music, do not cultivate choral music more generally. Even Berlioz in writing out his list of an ideal musical force to have at command makes his orchestra almost equal in numbers with his chorus, showing that he had a professional chorus in mind, and that therefore in his time (died 1869) a choral society of amateurs was perhaps unknown.

The Berlin Singakademie, still in existence and world renowned, was the first permanent choral society. Founded in 1791 with 27 members it now numbers 600. Mendelssohn was at one time its conductor.

In the United States the first choral society was the Stoughton (Mass.) Musical Society (1786), the outgrowth of a "sacred singing school" founded in 1724. The Handel and Haydn of Boston (1815) was of much greater importance, however, and is to-day one of the most important choral societies in the New World. Until 1847 the president of the society was its conductor, but with the increase of musical ability and criticism it was felt that the time-honored custom would have to be given up. Under Bergman (1852) and Zerrahn (1854) it increased in numbers and ability. Within the last few years under Mollenhauer (1901) a thorough reorganization took place and the society has recovered the position which it had to some extent lost.

The Cecilia Society, founded in 1900, under the direction of B. J. Lang, has done good work in the field of choral music.

In New York a number of choral societies, the Handel and Haydn, the New York Choral Society and the New York Sacred Music Society, dating from 1819 to 1849, fostered the taste for choral music. After this for more than 20 years no long-continued effort was made to carry on the work, until in 1873 Dr. Leopold Damrosch founded the Oratorio Society which, beginning with about 50 members, now numbers nearly 300. Walter Damrosch, son of Dr. Leopold Damrosch, succeeded him as conductor, and Frank Damrosch, another son, is the present conductor. The latter is also conductor of the Musical Art Society, devoted to the performance of older church music, and the People's Choral Union of 2,000 voices drawn from the laboring classes.

Philadelphia has had several notable choral societies, the Handel and Haydn, the Beethoven, the Cecilian and the Philadelphia Chorus, conducted by Henry G. Thunder, Michael H. Cross, Chas. M. Schmitz, and W. W. Gilchrist. These have all passed away, but in their stead is a new and vigorous chorus of 300 voices, founded in

CHORALE — CHOREA

1897 and conducted by Henry Gordon Thunder, son of Henry G. Thunder.

In Baltimore the Oratorio Society under Pache, and in Washington the Choral Society under Kaspar, are presenting standard works in an adequate manner.

In Chicago the Apollo Club (1872) under Harrison M. Wild, and in St. Louis the Choral Symphony Society (1870) under Ernst, are bending public taste toward the great choral works.

While the giving of music festivals involves the forming of a large chorus in conjunction with orchestra and soloists, it does not appear that such bodies of voices are appropriately styled choral societies in the strict sense; hence only passing mention is here made of the Springfield, Worcester, and Cincinnati festivals, all of which have large and efficient choruses conducted by Chadwick, Goodrich, and Theodore Thomas.

A difference, however, must be made between these choruses and the Bach Choir of Bethlehem, Pa. This unique organization of about 100 voices under the direction of J. Fred Wolle has devoted itself to the presentation of the works of John Sebastian Bach, and in the three festivals held in 1900, 1901, and 1903 has achieved a national reputation for itself. It produced the great Mass in B minor for the first time in America, besides giving the Matthew Passion, the Christmas Oratorio and other works in a most impressive manner. To some extent this was no doubt due to the unusual and reverential surroundings, the old Moravian town, the venerable church in which the performances were held, the announcement of the performance by a choir of trombones in the belfry. All these details no doubt helped greatly to create an atmosphere of simplicity and sincerity that affected the audiences that gathered from far and wide, but the real effect was the chorus work, which was done with an earnestness and devotion that were most impressive and caused the often inadequate solo and orchestra work to be forgotten.

HENRY GORDON THUNDER.

Conductor Philadelphia Chorus.

Cho'rale. See CHORAL; CHORAL SERVICE; CHORAL SOCIETIES; MUSIC; GREGORIAN CHANT; etc.

Chorazin, kō-rā'zīn, Palestine, one of the cities in which Christ's mighty works were done, but named only in his denunciation (Matt. xi. 21; Luke x. 13). It was known to St. Jerome, who describes it as on the shore of the lake, two miles from Capernaum. Robinson locates it at the modern Tell-hūn, three miles northeast of Capernaum, but this location is doubtful. Though the town was evidently of some importance, judging from the extensive ruins to be seen there, it has received little or no attention in ancient writings, the only mention of it being in the New Testament. It has been identified with the modern Kerazeb.

Chord, (from the Greek word *chordē*, a string of gut). 1. In music, the simultaneous and harmonious union of different sounds, at first intuitively recognized by the ear, and afterward reduced to a science by the invention of the laws or rules of harmony. Chords may consist of from two to five parts. Absolute chords of two parts are produced only by thirds or sevenths. Chords of more than two parts are either fundamental chords or inversions of

them, and are divided into concords and discords. The union of sounds in all chords will be found, on analyzing their component parts, to be an admixture of major and minor thirds. The common chord of *Trias harmonica perfecta*, is the basis of all harmony, and consists of a base note, or prime, with its third and fifth above. These three sounds are the distance of a third from each other. When the lowest third is the greater third, as above, the chord is a major chord; but when the lowest third is the lesser, the chord is called a minor chord. A chord of two minor thirds combined is called diminished, as the interval from the lowest note to the highest is less than a perfect fifth, the common chord admits of two inversions, according as one or other of its notes is made the base, or lowest note of the chord.

By adding another third above the common chord, a chord of four parts is produced, which is called the chord of the seventh, because the highest note is a seventh above the bass. When the chord of the seventh is produced on the fifth of the scale it is then called the dominant seventh, which is the most perfect species of the chord. It then consists of a major third, perfect fifth, and seventh, the minor, which is the next harmonic produced by nature above the fifth. The chord of the seventh may be formed also on any of the notes of the major or minor scale taken as a bass note, which produces the varieties of major, minor, and diminished seventh. The chord of the seventh admits of three inversions, according as the notes above the fundamental note are used as bass notes. From its nature, it requires a resolution, and is therefore always followed by a common chord, whose fundamental bass is a fifth below that of the seventh.

2. In geometry, a chord is the straight line which joins the two extremities of the arc of a curve; so called from the resemblance which the arc and chord together have to a bow and its string, the chord representing the string. The chord of a circular arc is obtained by multiplying the radius by twice the sine of half the angle which the arc subtends at the centre.

Chordata, kōr-dā'ta, the most advanced in development of the phyla, or branches, of the animal kingdom, the phylum which is characterized by the presence of a notochord (q.v.), and in its higher classes by the presence of a backbone and spinal cord. It includes all the vertebrates (mammals, birds, amphibians, reptiles, and fishes), and also *Amphioxus*, the ascidians, and *Balanoglossus* (qq.v.). Compare ADELOCHORDA.

Chorea, or **St. Vitus' Dance**, an acute convulsive disorder of childhood, characterized by sudden onset, irregular convulsive, non-rhythmical movements of the limbs or of the body and by a recovery usually spontaneous. There are many diverse conditions that have been called chorea in the past. There are strong reasons to believe that true chorea, however, is due to the action of some micro-organism; and, in view of the close relation it bears to rheumatic invasions in the same individual, the inference has been drawn by many serious students that chorea is a toxic disorder due probably to the same organism that causes acute articular rheumatism (Poynton & Payne). It occurs most frequently in the spring months.

CHORION — CHOSROES

in children from 5 to 15 years of age, and a nervous temperament seems necessary. The symptoms may be very slight, consisting of a grimace, or a sudden movement of the arms, causing the patient to drop anything held in the hands at the time. Or it may involve a large part of the musculature, especially the muscles of the extremities. It is non-symmetrical, the movements are sudden and jerky and non-purposeful, not representing any usual co-ordinated muscular act; hence the difficulty there is in imitating the movements. The attacks may begin in a few muscles, remain there, or spread widely. There may be slight or grave constitutional disturbances; some patients even die, although death is not a usual result in this country. In England, where rheumatic disorders seem to be more common, the disease seems to be more prevalent and more severe. The usual course of the disease is from four weeks to three months, but it may persist longer and even become chronic, although the chronic cases are probable forms of spasmodic tics. Treatment is very satisfactory. Rest, open air, nutritious diet, and some form of arsenic, are the general lines of treatment. Medical assistance is imperative, however, in view of the possible existence of heart lesions and other grave accompaniments of this affection. For hereditary chorea see HUNTINGDON'S DISEASE.

Chorion, kō'ri-on, the outermost of the membranes that surround the embryo. It is a most important structure in its developmental history as it comes into close contact with the decidua and is incorporated into the placenta, constituting the foetal part.

Chorley, chōr'li, **Henry Fothergill**, English critic and miscellaneous writer: b. Blackley Hurst, Lancashire, 15 Dec. 1808; d. London 15 Feb. 1872. His criticisms appeared mostly in the 'Athenæum' of London, displaying fine perception and exquisite taste in matters connected with literature and music. His novels, however ('Conti'; 'The Prodigy'; and 'The Lion'), are failures from the popular point of view, although finely written; and his plays, with the exception of 'Old Love and New Fortune,' are weak.

Chorley, a municipal borough and market town of England, in Lancashire, on the Chor, 20 miles northwest of Manchester. It consists of spacious well-built streets, and contains an ancient parish church, various other churches and chapels of modern date, together with a spacious town-hall, several large schools, club-houses, theatres, etc. The principal manufacture is that of cotton goods, but there are also bleaching, calico-printing, and dye-wood works, floor-cloth works, and iron foundries. In the vicinity are coal, lead, and iron mines, and millstone quarries. Pop. (1901) 26,850.

Choron, Alexandre Étienne, ä-lëks-ändr ä-të-ën shō-rôn, French musician: b. Caen 21 Oct. 1772; d. Paris 29 June 1834. He labored assiduously to promote musical education in France, founding his famous "Conservatory" in 1818. He wrote 'Principes de Composition des écoles d'Italie' (1808), and other valuable textbooks on music.

Cho'rus, originally a special feature in the Greek drama. During the most flourishing period of Attic tragedy the chorus was a troop of male performers, wearing masks, and repre-

senting male or female characters, who, during the whole representation, were spectators of the action. In the intervals of the action the chorus chanted songs, which related to the subject of the performance, and were intended either to augment the impression or to express the feeling of the audience on the course of the action. Sometimes it even took a direct part in the action by observations on the conduct of the dramatic characters, by advice, consolation, exhortation, or dissuasion. It usually represented a part, generally the oldest portion of the people, where the action happened, sometimes the counselors of the king, etc. The chorus was an indispensable part of the representation. In the beginning it consisted of a great number of persons, sometimes as many as 50; but the number of the tragic chorus was afterward limited to 15; while the chorus in comedy numbered 24. The exhibition of a chorus was in Athens an honorable civil charge, and was called choragy. (See CHORAGUS.) The leader or chief of a chorus was called coryphæus, who spoke in the name of the rest when the chorus participated in the action. The chorus was often divided into two parts, who sung alternately. The divisions of the chorus were not stationary, but moved from one side of the stage to the other; from which circumstance the names of the portions of verse which they recited, *strophe*, *anti-strophe*, and *epode*, are derived. But it cannot be determined in what manner the chorus sung. It is probable that it was in a sort of solemn recitative, and that their melodies, if we may call them so, consisted in unisons and octaves, and were very simple. They were accompanied by flutes. With the decline of ancient tragedy the chorus was omitted. Some modern tragedians, as Racine in France and Schiller in Germany, have attempted, with more or less success, to imitate or revive the Greek chorus. Shakespeare has employed devices founded on it.

Chorus, in modern music, is that part of a composite vocal performance which is executed by the whole body of the singers, in contradistinction to the solo airs and concerted pieces for selected voices. The singers themselves are also called the chorus.

Chose, shōz, a thing, a chattel, a piece of property; the subject-matter of an action. Chose is used in divers senses, of which the four following are the most important: Chose local, a thing annexed to a place, as a mill; chose transitory, that which is movable, and may be taken away or carried from place to place; chose in action, otherwise called chose in suspense, a thing of which a man has not the possession or actual enjoyment, but has a right to demand by action or other proceeding; chose in possession, a thing which a person has not only the right to enjoy, but also its actual enjoyment.

Chosroes (kōs'rō-ēz) I., King of Persia: d. 579. He succeeded to the throne in 531, and his memory is still venerated in the East, where his virtues obtained him the titles of the Magnanimous and the Just. At his accession Persia was involved in a war with Justinian, which Chosroes terminated successfully, obliging Justinian to purchase peace by the payment of a large sum of money. In 540, however, jealous of the victories of Belisarius, the great general

CHOSROES II.—CHOWCHOW

of the empire, Chosroes violated the peace, invaded Syria, laid Antioch in ashes, and returned home laden with spoils. The war continued till 562, when the emperor again purchased peace by an annual tribute of 30,000 pieces of gold. The peace continued for 10 years, when the war was renewed with Justin, the successor of Justinian, when Chosroes was again successful. His zeal for the administration of justice sometimes led him to acts of cruelty; but he encouraged the arts, founded academies, and made a considerable proficiency in philosophy himself. His reputation obtained him a visit from seven sages of Greece, who still adhered to the Pagan religion; and in a treaty with Justinian he required that they should be exempt from the penalties enacted against those who continued to favor Paganism. It was in the reign of Chosroes that the Turks first became known to Europeans, first as friends, afterward as enemies, of the Persian king.

Chosroes II., king of Persia, grandson of the preceding. He ascended the throne in 591, on the deposition of his father. He was assisted by the Emperor Mauricius, and on the assassination of the latter by Phocas (602) he took up arms against the empire, and refused to make peace at the solicitation of Heraclius, the succeeding emperor. By a long series of successes he raised the Persian power to the highest point, and reduced the empire to extremity. Heraclius, however, taking courage from despair, succeeded in a series of brilliant campaigns in recovering his lost provinces, 622-7. Chosroes, repeatedly defeated, was completely overthrown in the great battle of Nineveh. He fled with his favorite wife Sira, but after witnessing the massacre of his numerous sons he was thrown into a dungeon and assassinated by command of his son Siroes.

Chota Nagpur, or **Chota Nagpore**, chō tā nāg-poor', British India, a division of Bengal, a commissionership which is divided into the districts of Lohardaga, Hazaribagh, Singhbhum, Palamau, and Manbhum; area 26,966 square miles. It consists for the most part of an undulating plateau about 3,000 feet above the sea, and rising occasionally into ridges of hills which stretch from east to west. The drainage is received chiefly by numerous tributaries of the Subarna-rekha in the northeast, and by the north and south Coel and other streams in the south and west. Much of the surface is overrun with jungle, or covered with forests containing teak and other kinds of valuable timber. The soil in the plains consists of a red loam, and where under cultivation, produces excellent crops of wheat, barley, rice, pulse, cotton, and sugarcane. Coal occurs in various localities, and is worked in the Karharbari coal-fields in Hazaribagh. The trade, hampered by imperfect means of conveyance, is limited, and is nearly confined to grain, lac, coarse silk, oil-seeds, and other agricultural products. Pop. (1891) 4,628,792.

Chouans, shoo-än, a name given to the royalist peasantry of Brittany and lower Maine, who carried on a petty warfare against the republican government from an early period of the French Revolution. The name Chouan was finally extended to all the Vendéans. The name was derived from the first chief of the Chouans, Jean Cottereau, who with his three

brothers organized these bands in 1792, under the inspiration of the Marquis de la Rouarie, an ardent leader of the Royalists. Cottereau was the son and grandson of persons engaged in the manufacture of wooden shoes. He had joined a band of dealers in contraband salt, and acquired the surname Chouan from the cry of the screech-owl (*chat-huant*), which he used as a signal with his companions. He was killed in an engagement with the Republican troops, 28 July 1794. After the death of Jean Cottereau, the Chouans became quite lawless, engaging in guerrilla warfare and highway robbery. About 1800 they ceased to rob and terrorize, and, although, in 1815 an effort was made to revive the insurrection, they were suppressed by Gen. La Marque.

Chouans, The, a romance by Balzac, the novelist's first important work. The title, when it appeared in 1829, was 'The Last Chouan; or, Bretagne in 1800.' In 1846 it was rearranged in its present form. The author made a profound study of the scenery of Bretagne, and the manners of its people, before he wrote his romance; and his pictures of both scenery and people have the stamp of reality and truth.

Chough, chūf, a bird (*Fregilus graculus*), belonging to the sub-order *Fregilinæ* of the crow family, and particularly the Cornish chough. The name is derived from the cawing of the bird. It is widely distributed over Europe, India, and northern Africa, living in great colonies in the faces of precipitous cliffs. The bill is long and slightly curved; feathers black; the claws long and hooked, enabling it to cling to the slight projections of rocks and stone walls. It is often tamed and kept as a household pet, but is now disappearing, giving place to the jackdaw.

Chousinga, chow'sin-ga, a gazelle-like Indian antelope, remarkable for the fact that the buck has four horns. See FOUR-HORNED ANTELOPE.

Chouteau, shoo-tō, **Auguste**, American pioneer: b. New Orleans, La., 1739; d. St. Louis, Mo., 24 Feb. 1829. He was from his early youth a fur trader, and in 1763 set out with his brother Pierre Chouteau (q.v.) to establish trading stations in the regions west of the Mississippi. On this trip they founded the city of St. Louis in 1764.

Chouteau, Pierre, pē-är, American pioneer: b. New Orleans 1749; d. St. Louis 9 July 1849. He had few early advantages, but, becoming a fur trader, decided, in 1763, to extend his operations to the region beyond the Mississippi. With his brother, Auguste, he set out in 1763, joining a government expedition. He stopped in the heart of an unsettled country and founded, with his brother, the city of St. Louis.

Chouteau, Pierre, Jr., American fur trader, son of the preceding: b. St. Louis 19 Jan. 1789; d. St. Louis 8 Sept. 1865. He worked for his father and began trading in fur early in life. After establishing posts for the sale of skins throughout the trans-Mississippi region he purchased the fur-trading interests of John Jacob Astor.

Chowchow, a diminutive breed of Siberian sledge-dogs, improved and developed in China, whence they began to be imported into Europe and America at the beginning of the 20th cen-

CHOW-CHOW — CHRIST

ture. These dogs have the form and coat of their useful progenitors, and are very compact and sturdy of frame, and lively in disposition. The tail is carried tightly curled over the back. In color they are either all black, even to the tongue and inside of the mouth, or all white, blue, red, or yellow. This breed was not recognized in American bench-shows until 1902.

Chow-chow, a Chinese or pidgin English word meaning chopped up or broken and mixed. It is applied to a confection of mixed fruits made in China; to a mustard pickle of assorted ingredients made in India; and in the United States and Great Britain to a similar pickle usually compounded of chopped cabbage, green tomatoes, green or red peppers, spices, vinegar, mustard-seed, cucumbers, etc.

Chow'der (French *chaudière*, "a kettle"), a dish of French origin, composed chiefly of vegetables, pork, and fish or shell-fish, boiled together. Perhaps the most common form of chowder is that made from clams, either from the soft-shelled variety or the hard-shelled round clam or quahog. Chowder is a favorite dish on the New England coast and among the Newfoundland fishermen. A fish chowder is made as follows: Salt pork cut into small strips or dice is cooked for a few minutes in a deep iron kettle. Sliced or chopped onions are slightly browned in the pork fat, and onions and pork are then removed. A layer of sliced potatoes is laid in the kettle, then a layer of fish (small ones entire or large fish in slices), a layer of salt pork, one of onions, and so on alternately to the requisite amount. The fried salt pork and onions are also distributed through the mass, which should be seasoned throughout with salt, pepper, thyme, and savory. A very common ingredient is ship-bread or other hard crackers laid in between the other layers. A small quantity of water or of milk, or of both, is poured into the kettle, and the whole is boiled, without stirring, until cooked through. In adding the water or milk it must be remembered that chowder is a stew,—not a soup. Foreign cooks make a soup of clams, potatoes, onions, and tomatoes, which passes under the name of clam chowder. Genuine chowder is never disturbed until it is served, and in camps is portioned out, in layers, direct from the kettle.

Chrétien de Troyes, krā-tē-ën dè trwä, French trouvère: b. Troyes about 1150; d. about the end of the 12th or beginning of the 13th century. He translated Ovid's 'Ars Amandi' into French, and probably wrote some works based on the classics, but his fame rests upon the still extant romances of Arthur and the Knights of the Round Table, the materials for which were obtained from Geoffrey of Monmouth's rather credulous 'History of Britain.' They are entitled 'Iric et Guide'; 'Perceval le Gallois'; 'Le Chevalier au Lion'; 'Cliget'; 'Chevalier de la Table Ronde'; 'Lancelot du Lac'; and 'Guillaume d'Angleterre'; but the authorship of the last named is doubtful. Other two of his works, 'Tristan, ou le Roi Marc et la Reine Yseult' and 'Le Chevalier à l'Épée,' have been apparently lost. His language and versification were models for troubadours and romancers for a long time; and from him the Arthurian poets to the end of the 13th century borrowed episodes, themes, situations, charac-

ters, and all manner of poet's devices. Chrétien was a master of invention, fashioned for himself a competent literary vehicle, and made most effective use of his large knowledge of men and manners. See Förster, 'Christian von Troyes sämtliche erhaltene Werke' (1884).

Chriemhild, krēm-hilt. See KRIEMHILD.

Chrism, krīzm, a mixture of olive oil with balm (*opobalsamum*), which, being blessed by the bishop, is used in the Roman Catholic Church in the administration of the sacraments of baptism, confirmation, holy orders, and extreme unction, and in certain rites; as in consecrating the instruments of the divine service, as the sacred vessels, church edifices, altar stones. The chrism of the Greek Church is compounded of olive oil and a great variety of spices. In the Roman Catholic Church the holy oils are blessed by the bishop on the Thursday of Holy Week.

Chrisom, krīz'òm, the name of the white linen cloth laid by the priest on the child in Roman Catholic baptism, to signify its innocence. By olden usage it was generally presented by the mother as an offering to the Church, but if the child died before the mother was churched, it was used as a shroud. By a common abuse of words, Chrisom came to mean the child itself, being first applied in the old bills of mortality to denote such children as died within the month of birth.

Christ (Greek *Christos*, the anointed; *Messiah*, from the Hebrew, has the same signification). See CHRISTIANITY; JESUS.

Christ, Disciples of, a denomination of Christians in the United States commonly known as the Christian Church, or Church of Christ, and sometimes called Campbellites. In September 1809, Thomas Campbell, a Scotch minister of the seceders' branch of the Presbyterian Church, then living in western Pennsylvania, issued a "Declaration and Address," deploring the divided state of the Church, and urging as the only remedy a complete restoration of apostolic Christianity and the rejection of all human creeds and confessions of faith. The Christian Association of Washington, Pa., was formed for the purpose of promoting the principles set forth in this declaration. Mr. Campbell's son, Alexander, just from Glasgow University, Scotland, at once gave his splendid ability and learning to this new movement. It was not the intention of the Campbells to form a distinct religious body, but to effect the proposed reforms in the churches. Their plea was so opposed that they were compelled to act independently, and the first church in the new movement was organized at Brush Run on 4 May 1811. The Disciples maintained that having accepted the Bible as their only rule of faith and practice, and the only divine basis for the union of all Christians, they were led to reject infant baptism and adopt believers' immersion only. They observe the Lord's Supper each first day of the week, and heartily and practically accept and exalt the doctrine of the divinity of Christ. Their church policy is congregational, though they frequently hold conventions in the interest of world-wide missions, but not for legislative purposes. In 1900 the denomination had 6,528 ministers, 10,528 churches, and 1,149,982 communicants, besides

CHRIST — CHRISTEN

several universities and colleges of high rank, and a number of religious publications.

Christ, or Criss-Cross Row. See HORN-BOOK.

Christ in Art. The representations of the person of the Saviour which for a succession of ages have constituted one of the most important subjects of Christian art, and have occupied the highest genius, especially of Roman Catholic artists, are all evidently ideal. The attempt to represent the personal appearance of the Saviour can hardly be traced back further than the age of Constantine. The origin of Christian art, indeed, has been traced successfully to the catacombs of Rome, and is not to be considered as springing directly from Pagan art, although the great Italian masters of the Middle Ages may have derived much instruction from classical models; but the painting and sculpture of the early Christians were chiefly allegorical, representing the moral of the gospel parables, or similar symbolic representations of Christian doctrine, without regard to historical accuracy of portraiture. At a later period legends were invented of various likenesses of the Saviour having been preserved by miraculous or other remarkable means, but these stories are intrinsically weak and improbable, and are entirely destitute of external evidence. They are of such a nature as that King Abgarus of Edessa had a napkin sent him by the Saviour himself, in which he had caused his likeness to be miraculously impressed by placing his face in it. A portrait is said to have been similarly impressed on a handkerchief of St. Veronica, and St. Luke is said to have taken one himself. An apocryphal letter of Lentulus, the predecessor of Pilate, addressed to the Roman senate, contains a description of the person of Jesus. One of the earliest professed portraits of the Saviour is in the Calixtine Catacomb near Rome. He is represented with the hair parted on the forehead, and falling over the shoulders in long waving locks. In regard to this common notion it may be observed that when St. Paul wrote his first epistle to the Corinthians there were probably many Christians scattered over the world who remembered the personal appearance of the Saviour, and if this representation of it had been correct he would hardly have written to a Christian church that it was contrary to nature and a shame for a man to have long hair. The great painters of the Middle Ages, to whom we owe the ideal representation of Christ, probably founded somewhat upon these early notions. A Christ of the 4th century with an oval face, Oriental features, parted hair, and a short straight beard, is said to have been the model of the Byzantine and Italian painters till the time of Michael Angelo and Raphael. Consult Kraus, 'History of Christian Art' (Freiburg 1903).

Christ, Order of, on the abolition of the Templars by Clement V., in 1312, King Dionysius of Portugal preserved the order in his dominions, but changed its title to that of The Knights of Christ, or The Order of Our Lord Jesus Christ. This arrangement was sanctioned by Pope John XXI. or XXII., in 1319. The seat of the order was transferred from Castro-Marino to Thomar in 1366. The new order afterward attained such power that King John III. was obliged to obtain an edict from Pope Hadrian VI., in 1522, by which the grand-

mastership of the order became vested in the kings of Portugal.

Christ Church, College of, a notable institution in Oxford, England. In 1526 Wolsey obtained from Clement VII. a bull for the suppression of 22 monasteries, the site of one of which he chose for a new college, to be called Cardinal College, and which he intended to endow beyond that of any other in Oxford. On the fall of Wolsey, in 1529, the establishment came into the hands of King Henry VIII. In 1532 that prince founded it under the name of King Henry VIII.'s College, and in 1546 he once more re-established the college under the name of "Christ Church Cathedral in Oxford, or the Foundation of King Henry VIII., with a dean and canons, 60 students, 40 schoolboys, clerks, choristers," etc. The foundation is now subsisting, though it has undergone considerable modifications. According to the present statutes, which came into force in 1882, the students, who are equivalent to fellows, are divided into two classes, and are in number about 30, besides honorary students. There is also a body of scholars, over 40 in number, some of whom are elected annually from Westminster School, while others are chosen by open competition for proficiency in mathematics, physical science, or history. The students are appointed in the first instance for two years, but this term may be prolonged. There are also many exhibitioners.

Christadelphians, a religious body that originated during the American Civil War, their founder being Dr. J. Thomas. They believe that God will raise all who love him to an endless life in this world, but that those who do not shall absolutely perish in death; that Christ is the Son of God, inheriting moral perfection from the Deity, our human nature from his mother; and that there is no personal devil. Their chief newspaper in Great Britain is *The Christadelphian*, published in Birmingham. The works of Dr. Thomas and 'Christendom Astray' by Robert Roberts contain expositions of their religious views.

Christ'church, England, municipal borough in Hampshire, situated at the confluence of the Avon and Stour, about one mile from the sea. It is famous for its great priory church, dating in part from the early part of the 12th century. The church is over 300 feet long and contains a magnificent altar-screen. Fusee chains for watches used to be manufactured in Christchurch. Pop. (1901) 4,204.

Christchurch, New Zealand, a town, capital of the province of Canterbury, and the see of the primate of New Zealand, situated on the Avon River, seven miles from the sea, and is the terminus of the Great Northern and Southern Railway. A railway tunneled through the Lyttelton Hills connects it with Lyttelton, the nearest port. It contains a number of handsome buildings, including a fine cathedral, the government offices, St. Michael's church, the supreme court, hospital, museum, town library, lunatic asylum, convent, theatre, banks, club-house, and college, and has a flourishing trade and manufactures. Pop. (1901) 57,041.

Christen, krě'stĕn, **Ada.** See BREDEN, CHRISTINE.

CHRISTIAN I.—CHRISTIAN VII.

Christian I., king of Denmark and Norway: b. 1426; d. Copenhagen 21 May 1481. He reigned from 1448 to 1481, and in 1479 founded the University of Denmark.

Christian II., king of Denmark, Norway and Sweden: b. Nyborg, Fünen, 2 July 1481; d. Kallundborg, Zealand, 25 Jan. 1559. He was grandson of Christian I. In 1501 he was named successor to the crown, and took part in the government of Norway, which he conducted with great severity.

On his accession to the throne in 1513 he signed a capitulation in favor of the privileges of the lay and clerical aristocracy in his dominions, including the independent administration of justice; but all his efforts were bent toward strengthening the royal power, particularly in Sweden, which refused to acknowledge him. To strengthen himself against Steen Sture, the administrator of Sweden, who had set himself in opposition to the union of Calmar formed in 1397 between Norway, Sweden, and Denmark, he married Isabella, sister of Charles V. of Germany, in 1515. He had already a mistress called Dyveke, the daughter of a Dutch woman who kept an inn in Bergen, Norway. She exercised a great influence over the king, and by her liberal spirit and knowledge of the institutions of Holland tended greatly to improve the administration of his government. She became a sort of prime minister, and had great influence in originating those wise laws which gained for this king the love of his subjects. But she incurred the hatred of the nobility, and in 1517 died of poison.

Soon after war broke out with Sweden, and making all the preparations and alliances in his power, Christian sent an army into Sweden commanded by Otto Krumpen, who defeated the Swedes in the decisive battle of Bogesund (Ulrikehamn), 19 Jan. 1520, in which Steen Sture, the administrator, was killed. Stockholm, under the command of the widow of Sture, stood a siege of four months, and on 4 November, Christian was crowned king of Sweden.

Subsequently Sweden revolted under Gustavus Vasa, who had expelled the Danish garrisons and been proclaimed administrator. To find the means of defense Christian convoked the Diet toward the close of 1522. Instead of attending it the nobles and prelates assembled at Wiborg in Jutland, proclaimed the deposition of Christian, and called his uncle, Frederick, to the throne. Christian fled to the Netherlands to claim the succor of his brother-in-law, Charles V. Gustavus, already master of Sweden, put an end to the union of Calmar in 1523, and was proclaimed king. Christian remained nine years in exile without obtaining aid from Charles, and then visited England and Germany, and adopted the Reformed faith. At length, with the assistance of Charles, he equipped a fleet in Holland, landed in Norway in 1531, and was proclaimed king by the Norwegian Diet, which had refused to recognize Frederick. The commander of the Danish fleet, a bishop, having offered him a safe conduct, he repaired to Copenhagen to negotiate with Frederick, who disavowed the admiral, and retained him prisoner. He was confined for 12 years in the Castle of Sonderburg, island of Alsen, in a dungeon of which the door was walled up, the only

access being by the window, and his only attendant a Norwegian dwarf. In 1544 Christian III. somewhat relaxed the rigor of his confinement, and in 1549, on renouncing his right to the crown, he was permitted to reside in the Castle of Kallundborg in Zealand, where he was subjected to a less severe surveillance, until his death in 1559. His misfortunes were chiefly due to the enmity excited by his reforms, and his violation of the capitulation entered into at his coronation. See Behrmann, 'Kong Christiern II., Historie' (1815).

Christian III., king of Denmark and Norway: b. 1502; d. Kolding, Denmark, 1 Jan. 1559. He succeeded his father, Frederic I., and introduced the Reformed faith into Norway and Denmark. In his reign Norway was reduced to the status of a province.

Christian IV., king of Denmark: b. Frederiksborg, Zealand, 12 April 1577; d. Copenhagen 28 Feb. 1648. He was the son of Frederick II. and succeeded to the throne as a minor in 1588. He early gave numerous proofs of a sincere love of religion and justice, and a high esteem for science and art. He made his celebrated voyage to the North Cape to learn the boundaries of his kingdom and protect the rights of his subjects in that remote region from any foreign interference with their coasting trade. He was afterward, in consequence of the claims advanced by Sweden to Lapland, engaged in what is called the Calmar war with Charles IX. and his successor, Adolphus, and terminated it by an advantageous peace, in which he stipulated for the free navigation of the Baltic. In the Thirty Years' war he was beaten by Tilly at Lutteram-Barenberge in 1626, but afterward, in conjunction with Gustavus Adolphus, obtained the Treaty of Lübeck 1629. He has the merit of having laid the foundation of the Danish navy, extended the trade of his subjects to the East Indies, introduced a judicious system of finance, and fitted out several expeditions for the discovery of a northwest passage. He was succeeded by his son, Frederick III.

Christian V., king of Denmark and Norway: b. 15 April 1646; d. Copenhagen 25 Aug. 1699. He succeeded his father, Frederick III., in 1670, and carried on a long and fruitless war against Sweden.

Christian VI., king of Denmark and Norway: b. 30 Nov. 1699; d. 6 Aug. 1746. He succeeded his father, Frederick IV., in 1730.

Christian VII., king of Denmark and Norway: b. Copenhagen 29 Jan. 1749; d. Rendsburg, Holstein, 13 March 1808. He was the son of Frederick V., whom he succeeded in 1766. In the same year he married Caroline Matilda, sister of the British monarch, George III. He afterward traveled for three years in England, Germany, Holland, and France, and became a member of several learned academies. Youthful indulgences, however, had weakened his intellect, and obliged him to confide the charge of public business to his ministers, and more especially, it is said, to his favorite physician, Struensee, who, though he had gained the affections of Christian and his young bride, was very unpopular as a statesman, and made innovations which provoked the hostility both of the nobility and the army. Notwithstanding the unfortunate circumstances of Christian's reign,

several important improvements took place under it. Serfdom was abolished in the duchies, trade and commerce promoted, the Schleswig-Holstein Canal constructed, and excellent roads formed throughout the kingdom. Christian was succeeded by his son, Frederick VI.

Christian VIII., king of Denmark, and Duke of Schleswig-Holstein and Lauenburg: b. Copenhagen 18 Sept. 1786; d. there 20 Jan. 1848. He was chosen king of Norway in 1814, but, unable to hold it against Bernadotte, he abdicated in October of the same year. His reign was comparatively unimportant, the most notable event being the king's proclamation in 1846 that Schleswig and Holstein were inseparably united to Denmark. He was succeeded by his son, Frederick VII.

Christian IX., king of Denmark: b. 18 April 1818; d. Copenhagen 29 Jan. 1906. He was the fourth son of the Duke of Schleswig-Holstein-Sonderburg-Glücksburg, and succeeded Frederick VII., 15 Nov. 1863. His second son was, in 1863, elected king of Greece, and his two eldest daughters married heirs-apparent of the crowns of Great Britain and Russia.

Christian, German prelate: b. early part of the 17th century; d. Tusculum, Italy, 25 Aug. 1183. He was made archbishop of Mainz in 1165. He was chiefly celebrated for his military exploits under Frederick Barbarossa, for whom he opened the way to Italy. He fell in battle endeavoring to rescue Pope Lucius III. from a hostile Roman army.

Christian, Edward, English jurist: b. London 1774; d. Cambridge 1823. He was chief justice of the Isle of Ely, and law professor of Downing College, Cambridge. He was the author of various works, among which are treatises on the bankrupt laws, and on the game laws. He also edited an edition of Blackstone, to which he added numerous notes.

Christian, The, a novel by Hall Caine, published in 1897. For the most part the scene is laid in the London of to-day. The details of London life are spectacular, and the object of the book seems to be to show the inadequacy of London churches to save the city.

Christian Archæology, that department of archæological science which, through the study of inscriptions, monuments, frescoes, household and ecclesiastical utensils, seeks to throw light upon the ideas, customs, and events of the early Christian communities. It may be said to have a beginning in the days of peace following the Diocletian persecutions. The Acts of the Martyrs were collected and critically examined, but in the 5th century the reading of some of these Acts was forbidden in the Roman Church by Pope Gelasius because of the mixture of legend and fact they contained. The Acts written between the 8th and 10th centuries have very little critical value, although they contain an element of truth, as the name of the martyr, the date of his death, the name of the judge of the trial, above all his place of burial, for the Catacombs were still visited. Le Blant, in his 'Supplement to the Acta Sincera Martyrum of Ruinart,' has shown how it is possible to separate the facts in these Acts from their setting of rhetoric and legend.

From very early times it was the custom to mark in the local calendar, the Church feasts celebrated each year. Each Church had its own calendar. The most ancient that have come down to us are those of Rome, Tours, and Carthage. Later, calendars of the principal Churches were united and called martyrologies. The 'Martyrology of Jerome,' made in Italy about the middle of the 5th century and revised at Auxerre, in France, toward the end of the 6th century, is the source from which are derived existing manuscripts. Other martyrologies are those of Saint Bede, in the 8th century, of Rabanus Maurus, of Adon, bishop of Vienne, in the 9th century, and of Usuard, compiled about the year 875. The Roman Martyrology was revised by Cardinal Baronius in 1598.

In addition to the martyrologies there is also the 'Liberian Calendar,' so called from Pope Liberius, in whose pontificate it was compiled. It contains a list of the Roman consuls and the Roman prefects from 254 to 354, the epoch of Pope Liberius, the date of the death of the bishops of Rome during the same period, and also the date of the death of many martyrs, together with the names of the places where they suffered martyrdom and where they were buried. It also mentions the principal feasts of the Roman Church: Christmas, Easter, the Chair of Peter, and some of the more solemn feasts of the martyrs.

The 'Book of the Popes' ('Liber Pontificalis') is a collection of biographies of the Popes from Saint Peter to Stephen VI. (891). Until recent years its authorship was assigned to Anastasius, the librarian, who lived in the 9th century.

Duchesne and Mommsen both agree that the collection as we have it is a second edition, and that it is an expansion of certain primitive catalogues of the Popes, some of which date as far back as the 2d century.

In the opinion of Duchesne, the biographies of the Popes from the 6th to the 9th centuries were written by contemporaries. The 'Book of Popes' has been edited in the 17th century by Fabrotti (Paris 1647), by Bianchini (Rome 1718), by Muratori and by Migne in the 19th. The text may now be said to be fixed by the edition of the Abbe L. Duchesne (Paris 1886-92).

Of great importance in determining the topography of the Catacombs and the churches and shrines of the early Church are the guide books written by the pilgrims of the Middle Ages. The earliest of these is the 'Itinerarium' of John the Priest, which belongs to the end of the 6th century. John was sent by Theodelinda, queen of the Lombards, to Gregory the Great to obtain relics of the martyrs. These he did not obtain, but he brought back with him oil from the lamps that burned before their tombs. On each phial he inscribed the name of the martyr and the place of his burial. The original catalogue written by John is still preserved in the treasury in Monza.

The best known guide book is that of William of Malmsbury, compiled in the 12th century, perhaps for the use of the Crusaders. Other guide books are those preserved in the monasteries at Einsiedeln and Salzburg. They throw much light on the topography of the

CHRISTIAN ARCHITECTURE

Catacombs. To these same pilgrims and to the monks of the 8th century we owe many collections of inscriptions, that have since perished. The 'Codex Palatinus' of Heidelberg contains more than a hundred, some of them in metre, taken from the papal tombs of the 4th, 5th, and 6th centuries. Other collections of inscriptions from Rome, Ravenna, Milan, France, and Switzerland are preserved in Saint Gall, in Switzerland, in Verdun, and Würzburg.

During the Middle Ages the study of ancient Christian monuments was neglected, the Catacombs were well nigh forgotten, but interest in them was revived at the time of the Renaissance and rediscoveries in the 16th century made possible scientific examination. Anthony Bosio, *charge d'affaires* of the Order of Malta, spent 30 years in the Roman Catacombs, reproducing mural paintings, deciphering and copying inscriptions. He has been called the "Founder of Christian Archæology," but this title belongs by better right to John Baptist de Rossi, who, by his explorations and writings, has given to the study the character of an exact science. He was a Roman, who, at the age of 24, began the study in 1842 under the direction of Padre Marchi, and his 50 years' labor accomplished much in reconstructing the artistic, doctrinal, and family life of the Christian community of early Rome. He died in 1899, leaving his work to be carried on by Armellini, Marucchi, Wilpert, and Stevenson. His classic 'Roma Sotteranea' has been translated in part into English by Northcote and Bronlow.

Bibliography.—Armellini, 'Archeologia Christiana' and 'Le Chiese di Roma'; Marucchi, 'Elements d'Archeologie Chretienne'; Lanciani, 'Pagan and Christian Rome'; Smith, 'A Dictionary of Christian Antiquities'; Duchesne, 'Christian Worship, Its Origin and Evolution'; Wilpert, 'Principienfragen der Chrislichen Archaologie'; Mommsen, 'Romische Geschichte.' REV. WILLIAM J. WHITE, D.D.,
Brooklyn, N. Y.

Christian Architecture, that of the schools which have grown up among the peoples generally Christian in belief; but more especially the architecture of churches and their dependencies. The term is used commonly in both senses. Thus, at the time of the Gothic revival in England (most active between 1850 and 1870) the term "Christian architecture" was used especially to denote Gothic art and Gothic and Romanesque art taken together; and this because it was assumed that those styles were peculiarly the creation of the Christian organization, as distinguished from the neo-classical styles of the Renaissance and later epochs, which had obviously been developed from the study of ancient Greco-Roman architecture.

Styles which are in a strict sense Christian are (1) the Latin style, identified with the basilicas of the Western church built from the 4th to the 9th century, and most numerous in Italy, especially in Rome and Ravenna. The Christian basilicas are extremely simple in structure and design. The entrance is generally from a square peristyle, like a cloister; though the narthex or vestibule often replaces it. A nave from 30 to 50 feet wide is divided from two aisles by rows of columns often taken from classical buildings. These col-

umns carry the clear-story wall which rises above the aisle roofs and between the windows of the clear-story, and above and below the windows there are large flat surfaces commonly filled with pictures and decorative scroll-work in mosaic. There are sometimes two additional aisles. The aisles and the nave all stop against the transept, which is often higher and generally wider than the nave and is the most striking part of the buildings, but in many of the smaller basilicas no transept exists. Beyond the transept, that is, farther from the entrance doors, an apse projects, and this originally contained the seats of the bishop and his clergy. The high altar had different places at different periods, but the middle of the transept, on the axis of the great nave, was the more usual place, and a baldachino or permanent canopy was built over it—a feature which was preserved in later Italian churches; (2) the Byzantine style, finding its great central monument in the Church of St. Sophia, Constantinople, and spread over the Balkan Peninsula, parts of Asia Minor, and Syria, with offshoots in Egypt and Persia, and with more recent developments among the churches of Russia (this is described under ARCHITECTURE); (3) the Romanesque style of western Europe, developed from the attempt of the church builders to roof their naves and aisles, choirs and apses, with vaulting, copied at first from the imperial Roman examples, which were numerous throughout western Europe, but always with inferior materials and skill; then developing into a more florid style, taking different characteristic forms according as it was influenced more or less by Eastern intercourse, and spreading over Europe from Hungary to Scotland and Spain (see ARCHITECTURE and ROMANESQUE ARCHITECTURE); (4) the Gothic style, which is the Romanesque style carried to its legitimate sequence in the way of vaulting, but greatly changed by the very perfection of that constructive process, the buildings growing larger and lighter, more open, and with a constant tendency of the walls to disappear until the building becomes a stone roof supported on light uprights, with no wall surface except under the great windows; the windows themselves very rich in colored glass, and filling large parts of the upright screen or enclosure of the buildings. (See ARCHITECTURE and GOTHIC ARCHITECTURE.) These are the four great divisions of Christian architecture in the strictest sense; all these styles are treated in the general article Architecture (q.v.).

There are exceptional forms, less important but very interesting, hardly to be classified under the above general divisions. Thus, there exists in Syria a style of building which was entirely unknown until the explorations of the Comte de Vogüé (about 1860-5) and which has been studied since by an American expedition. This is a Romanesque of singular simplicity and consistency of design, the buildings being entirely of stone, roofed and fitted in every part with solid stone, and the whole style growing out of imperial Roman construction as adapted to a country where stone was the material most easily procured. The resulting style was, however, generally unrestrained by Greco-Roman traditions. The general design and the sculptured detail alike were singularly

CHRISTIAN BROTHERS — CHRISTIAN CHURCH

free, original, logical, inevitable, in their conception. It has been pointed out by French critics that the quality of clearness and original thought in design is present in all the earlier and finer buildings. The Christian symbolism, which, in its more elaborate forms, is shown most perfectly in the mosaics of central Italy (see the Latin style above), is seen in its simplest form carved on the lintels and wall-panels of these churches. The cross in its many forms, the sacred monograms and ciphers, the vine and other plants identified with the Christian teaching of the East, are used with marked success in these carvings, both as symbolism and as decoration. The churches of Syria are of singular simplicity and charm. Again, although the Gothic architecture of Europe reached its culmination at the close of the 13th century, and was less energetic, less fruitful of new thought during the 14th century, this was followed by an independent and most attractive style in the 15th century, which on the Continent we call generally the Florid Gothic or Flamboyant style, whereas in England it took the shape of the formal and rigid Perpendicular, and passed into the Tudor style with its fan vaulting. (See VAULT.) Yet again, as the Italians never understood Gothic architecture nor sympathized with it, there are only a few monuments which are strictly Gothic, but the great cathedrals of Orvieto, Siena, and Florence, and churches throughout the peninsula and in Sicily, are Gothic in detail, and are adorned by a magnificent system of sculptured and colored decoration. It is to be noted that from the beginning of the 15th century onward the artistic design is less and less dependent on church buildings; the important dwellings of the nobles in the country, and of citizens in the towns, modifying greatly the style of the day and sometimes taking the lead away from ecclesiastical structures. It is entirely a matter of private judgment how far this change tends to remove those later styles from the field of Christian architecture. RUSSELL STURGIS,

Author 'Dictionary of Architecture.'

Christian Brothers. See BRETHREN OF THE CHRISTIAN SCHOOLS.

Christian Brothers, College of, situated in Saint Louis, Mo. In 1855 it was established and incorporated with power to confer degrees. The modern language department is given special attention, the pupils being required to converse and write in French, German, and Spanish. Practical engineering, mechanical and scientific draughting and designing are emphasized in the scientific department. Literary and musical courses are aided by the various organizations which contribute to the development of good taste. The graduates of this college are among the distinguished men of the country.

Christian Church, The. The purpose of this article shall be to regard the Church as a divine institution, and to take a rapid glance at some of the leading events of its history.

In considering the first point, the attempt may be made to find the source and significance of its name. This comes to us from the Greek, but along two differing lines of derivation. The English word church comes from the Anglo-Saxon *cyrc*, or *cyric*; in the Scotch it is *kirk*, and in the German *kirche*. But the Anglo-

Saxons obtained it from the Goths, who were the first of the barbarian tribes of the north to accept Christianity. They, in turn, had taken their name for church from the Greek Christians of Constantinople, or *κυριακόν*, meaning "House of the Lord."

The second source of information concerning the term church is found in the New Testament Greek, where the inspired writers use the word *ekklesia*, which, in our language, is translated church. This has reference to the assemblies of the Lord's people. The original meaning of *ekklesia* is an assembly of people called together for any purpose, and not necessarily religious. The word is even applied to that disorderly and tumultuous crowd of which we read (Acts xix. 32, 39, 41). But ordinarily it means a meeting for religious purposes, and, save for this instance, it is used for the assemblies of God's people. The word *'ekklesiá*, therefore, is a fitting word to express the nature and purposes of a Christian assembly or body. It is derived from two Greek words, the preposition *'ek*, meaning out, from, and *kalein*, to call. The word, then, means to call out, to call from, and hence is descriptive of an assembly of saints called out of or from the world to be God's people. Furthermore, the word is used to designate a local assembly of Christians or portions of the whole Church, and this is employed also in the plural. It is used of the Church universal. It is likewise employed in reference to the whole number of the redeemed in heaven and on earth, the *Church militant* and the *Church triumphant*.

The Church is also spoken of under a number of significant figures or symbols, which, in their several ways, indicate some of its properties and characteristics. It is called a flock or fold, of which Christ is the supreme Shepherd. It is the bride of Christ. It is likened to the human body, with its various members and functions, and hence the Church is called the "Body of Christ," and we are "members of his body, of his flesh, and his bones." This is Paul's favorite figure. Again, the Church is spoken of as *visible* and *invisible*. These characteristics are early spoken of in the Church as making an important distinction in its temporal constitution and relations. The Donatists, Novatians, Montanists, ancient Puritans, insisted that, in order to the purity of the Church, it must not allow any in its membership that were not holy, else it were not "the holy catholic Church." Against this extreme and impossible condition for the Church, in its present earthly state, Augustine contended for the distinction of the Church as both an invisible and a visible body, composed partly of those who were sanctified, and partly of those who were unholy. The Church is still "the Body of Christ," though, like the human body, all its parts and members be not in perfect soundness, like the field in which there is a mixture of wheat and tares. If this distinction were not allowed, then we could not be sure of the validity of the Church's ordinances, for if they are vitiated by the administration of unholy men, then no one could know whether he was properly baptized or had received the Lord's Supper. Moreover, God alone, who knows the heart, can tell the regenerate from the unregenerate, for the graces of the Spirit are not the subjects of

CHRISTIAN CHURCH

observation and therefore not of physical demonstration. The result is that the Church as an *organism*, created by the Holy Ghost in "the clean heart and right spirit," is invisible; but as an *organization*, with living members, sacraments, and Word, politics and worship, it is visible.

These distinctions are also indicated in the Scriptures by the use of different terms in describing the collective people of God. The terms kingdom of God, kingdom of heaven, kingdom of Christ are used more than 100 times in the gospels, while the word Church is used only twice (Matt. xvi. 18; xviii. 17). The purpose of Christ was not to organize but to create a condition for organization by pouring the fullness of his life and spirit into the hearts of his disciples who, under his divine Headship and the guidance of the Holy Spirit, should constitute the outward form and order of his earthly kingdom. Hence, we read: "The law was given by Moses, but grace and truth came by Jesus Christ. And of his fulness have we all received, and grace for grace" (John i. 14-17.) Acting under the instruction of the "Great Commission" (Matt. xxviii. 19, 20), the disciples, by baptizing and teaching in his name, would need all the requisites of a constituted Church. Hence it is that in the gospels, which record the discourses of Christ, little is said of the Church as an institution, while in the Acts and Epistles we read much of the Church, its order, privileges, and work.

The kingdom of God, which consists not in meat and drink, or any other merely outward observance, is internal and subjective (Rom. xiv. 17), while the Church is objective, is like a city set upon a hill, a light upon a candlestick, is salt in the earth, and realizes all of the many metaphorical descriptions employed to set forth its outward manifestations. Aside from these scriptural representations, the definitions and affirmations, which the Creeds and Dogmaticians have recorded concerning the Church, furnish the basis of its historic position in relation to other world institutions.

In the earliest, most generally received, and least controverted of all the creeds of Christendom, "The Apostles' Creed," we read: "I believe in the holy, catholic Church; the communion of saints." This accepted definition has received various expansions and discriminations in the symbols of the Church and from eminent men, which serve to part some of the professors of the faith of Christ, into communions of greater or less extent. Taking some of the more ancient and numerous bodies of Christians as representative and illustrative, we may note the deliverances of the Roman Catholic Church. This body has defined (Catechism of Trent) "The Church as one, because there is one Lord, one faith, one baptism; but more especially because it has one invisible Ruler, Christ, and one visible, namely, the occupant for the time being of the chair of Saint Peter at Rome," etc. The eminent Bellarmine, speaking for the same Church says: "It is a society of men united by a profession of the same Christian faith and a participation of the same sacraments, under the government of lawful pastors, and especially the one vicar of Christ on earth, the Roman Pontiff." The catechism of the Greek Church gives the following definition: "The

Church is a divinely instituted community of men, united by the orthodox faith, the law of God, the hierarchy and the sacraments." (Full catechism of the Orthodox, Catholic, Eastern Church, Moscow, 1839.) The Lutheran Church defines the Church to be "A congregation of saints, in which the Gospel is purely preached and the sacraments are rightly administered" (Augsburg Conf., Art. 7). The Church of England (Art. 19) gives the following: "A congregation of faithful men, in which the pure Word of God is preached, and the sacraments are duly administered, according to Christ's ordinance in all those things that are of necessity requisite to the same." The same definition is given by the Methodist Episcopal Church. The Scottish Confession (Art. 16) defines the Church to be "A society of the elect of all ages and countries, of both Jews and Gentiles; this is the catholic or universal Church." The Confession of the Polish Churches (*Declaratio Thoruniensis*) says: "There are particular Churches and the Church universal. The true universal Church is composed of the community of all believers, dispersed throughout the world, who are and remain one catholic Church so long as they are united by subjection to one head, Christ, by the indwelling of one Spirit and the profession of the same faith; and this, though they be not associated in one common, external polity, but as regards external fellowship and ecclesiastical regimen, be not in communion with each other." Dr. Gerhart, speaking for the German Reformed Church of America, says: "The Christian Church is a divine-human institution in time and space; divine as to its ultimate ground and interior life, and human as to its form; brought into existence by the miraculous working of the Holy Ghost on the day of Pentecost, who is sent by Christ as the bearer of his incarnate life, in order to continue and develop this life and salvation, according to the law of his Spirit, in its membership, down to the end of time uninterruptedly. As such, it is not a collection of units, but an objective organism that has a principle of unity, a law, organs and resources of power and grace which are in it and its own absolutely." (*Bibliotheca Sacra*, 1863, pp. 53, 54.)

From these definitions, scriptural and theological alike, it becomes apparent that a distinction exists between the Roman Catholic and the Protestant ideas of the Christian Church. This distinction must necessarily be vital and discriminating, because, in the one case, the genius of that idea finds its dominant expression in the authority of the Christian body represented by it, and in the other, the ground for its existence and Christian name finds place in the attitude man assumes toward the truth; or, as the whole matter may be put, the authority of the Catholic Church rests upon its declarative position, as defined by the Council of Trent, which says "it is contained in the written books and the unwritten traditions which, received by the Apostles from the mouth of Christ himself and from the Apostles themselves, the Holy Ghost dictating, have come down even unto us." Here the ways of the Roman Catholic and the Protestant bodies part; the one choosing the scriptural and traditional basis for its infallible authority, the other resting its power of life upon the Scriptures alone as the only infallible rule of faith.

CHRISTIAN CHURCH

and practice. From such a position the presentation of the truth to men for their salvation could be through some form of an institutional method, while with Protestant nations, concerning the foundations of faith, the authority of the Church must be in the democracy of regenerated individuals.

Now, in the application and expansion of these separative and contrastive principles, consideration must be given by the Christian denominations themselves to their particular forms of belief and government. For after all, the distinguishing marks between them are their credal statements and their modes of organized service toward humanity. These differences may be briefly noted in the following manner: The theological system of the Roman Catholic body is, and has always been, Tridentine, and is singularly and consistently characteristic in its emphatic declarations respecting the Scriptures, private judgment in their interpretation, the essential doctrines of salvation, sin and justification, the merits of works and penance, the divine nature of the Church, with its seven precious sacraments, its consecrated priesthood, and the administration of its secular and spiritual affairs, through recognized channels of official authority; supervisory rights of the clergy, the residential control of bishops in dioceses, and the immediate and vicarious power of the great Head of the Church, the Pope. The Protestant bodies, on the other hand, taking also for their basal symbol the Nicæno-Constantinopolitan creed, have enlarged their conceptions and opinions of it in the various creeds which are their theological foundations. But in these declarations they have been for themselves no less definite and authoritative than the Catholics, though, of course, in many of the statements regarding the essential doctrines of salvation their evangelical character is very manifest; while in the politics of the many denominations representing multiplied forms of Christian work, the quality of government is measured by the integrity and organized efficiency of each one's own rules without ecclesiastical absolutism or personal authority. These are the principles, in sum, that set apart the Roman Catholic and Protestant bodies.

The second part of this article includes a brief review of the history of the Church from its inception to the present day. There are three chief periods to be noted: I. The Ancient Period, extending from the days of Christ and his apostles to 750 A.D. II. The Mediæval Period, from 750 A.D. to the Reformation, 1517 A.D. III. The Modern Period, from 1517 A.D. to the present day. Of these great periods minor epochs may be noted, as follows: First, from the days of the apostles to the death of the last of their number, about 100 A.D.; the progress of Christianity until Constantine, 313 A.D.; the supremacy of the Church in the Roman world to 590 A.D., or the age of Gregory I.; the founding of the Church among the Germanic nations to 800 A.D.; the growth of the papacy to the pontificate of Gregory VII., 1073; the full sway of the papacy in western Europe to the accession of Pope Boniface VIII., 1294 A.D.; the revolt from the papacy and movements toward reform to the posting of the Theses by Luther, 1517 A.D.; the Reformation and the conflicts of the different Christian bodies to the Peace of West-

phalia, 1648 A.D.; the changes and conflicts consequent on a new era in culture and philosophy to the French Revolution, 1789 A.D.; the era of the present from the French Revolution, the era of science, social reform, and missionary enterprise until this day.

The Ancient Period, 33-750 A. D.—After the ascension of the Saviour, and prior to Pentecost, the number of the disciples who gathered in the upper room at Jerusalem, as commanded by the Lord, was 120 souls (Acts i. 15). Immediately after this latter event we read of an accession of 3,000, consequent upon the outpouring of the Holy Ghost, according to the promise of Christ to send a Comforter to be with his Church forever and to guide his disciples into all truth. Following the Pentecostal outpouring, "the Lord added to the Church daily those that were being saved." In a short time the number of the disciples at Jerusalem was given as being about 5,000 (Acts ii. 47; iv. 4; John xiv. 16, 17, 26; xv. 26; xvi. 7, 14). After the persecution that arose about Stephen, the first Christian martyr, we read that the disciples were scattered abroad and "went everywhere preaching the word." Going throughout Judea, Galilee, and Samaria, they established churches, which rapidly grew and multiplied into a very great number. A powerful and influential church was established at Antioch, at which the disciples were first called Christians. From this church there went out the first missionaries, Paul and Barnabas, who entered Asia Minor and preached the Word so successfully that a number of churches were established. This was the beginning of a great world-wide diffusion of the Gospel, which has been going on and extending to this very day. Important centres were established, but the Gospel was largely confined to the lower and middle classes. Controversies arose between the Jewish and Gentile Christians, but the wisdom and moderation of the Apostles were sufficient to harmonize the dissidents and preserve peace. The prevalence of Oriental philosophy, in the form of Gnosticism, produced many heresies in this age, but they were of limited influence and of transient duration. Many able and earnest Christian apologists arose for the defense of the faith; some of these may be mentioned, as Aristides, Justin Martyr, Melito, Tatian, Hermas, etc. The early ages of the Church were tried by repeated and cruel persecutions, 10 in all. The most serious of these were under Nero, Domitian, Diocletian, Decius. The Scriptures were reduced to a canon, and the Church triumphed in spite of all hindrances, from within and without. Some of the more important writers were Ignatius, Irenæus, Origen, Tertullian, Clement of Alexandria. The more serious schisms were produced through Felisimus, Novatus, and Miletus. The doctrinal controversies related chiefly to eschatology, human depravity, and the divinity of Christ. The Council of Nice (325 A.D.) was a great triumph for orthodoxy. It declared the essential Trinity of the Godhead, and settled for all time the divinity of Christ as a fundamental doctrine of Christian faith. The heresy of Arius was condemned. Persecution ceased, through the sympathy of the Emperor Constantine, who, in 313, removed all disabilities from Christians, and in 323 made Christianity the state religion of the Roman empire. Monasti-

CHRISTIAN CHURCH

cism increased rapidly. Julian the Apostate endeavored to revive paganism, but without avail. Pope Leo the Great greatly extended the authority of the Western Church. Mohammedanism paralyzed the Eastern Church for a time. Mohammed was born in Mecca, Arabia, 570; declared himself a prophet in 609; founded a new religion, based upon the Koran; conquered Arabia, and died in 632. He was succeeded by the caliphs, who conquered all north Africa, western Asia, and gained a foothold in Spain and the south of France. Mohammedanism was arrested in western Europe by Charles Martel, by the victory of Tours, in 732. The most important recent defeat of Mohammedanism in Europe has been the triumph of Russia over Turkey in the war of 1877, and the practical disruption of Turkey in Europe, and the liberation of the Christian provinces. Pope Gregory the Great ruled from 590 to 604. He organized orders, elaborated the Church festivals, and established a mission among the Anglo-Saxons. Christian art was patronized liberally by the Roman pontiffs. The close of the ancient period found the Latin Church vigorous, but the Eastern Church in a stagnant condition.

Mediæval Period, 750-1517 A.D.—The Middle Ages were the transition from the ancient to the modern period. The most important political events, all of which had a bearing on the Church, were the end of the Greek exarchate in Italy; the destruction of the Lombard kingdom, the organization of the Frank empire under Pepin, rise of the new Germanic Church, division of the Mohammedan caliphate, decline of the Greek empire, and development of the new Roman empire in the West. Charlemagne was the greatest mediæval ruler. He was victorious over many northern tribes, and increased the territory of the Church to vast proportions. He was a liberal patron of learning, and authorized a Latin version of the Scriptures. Alfred the Great of England reigned from 871 to 901, and was as distinguished for learning as for his power to rule. The Russian monarchy was founded by Ruric in the middle of the 9th century. The Hungarians, Bulgarians, Bohemians, Moravians, Wends, and Scandinavians accepted Christianity. Great disorders and corruptions appeared in the Church at this time. The violent rule of the Mohammedans over Palestine excited the wrath of western Europe, and crusades were organized for the rescue of the country from the Moslems. There were seven crusades, extending from 1096 to 1272. Christian Europe failed, finally, to hold the country, but the general effect of the crusades was beneficial in the development of commerce, introduction of Oriental thought, and the knowledge of various Oriental sciences. Pre-Reformation movements were inaugurated through the Waldenses (1170); Wyclif (1324); John Huss (1373); the Moravian Brethren (1417). Mysticism greatly developed at this period through Tauler, Suso, Ruysbroek, Groot, Thomas à Kempis, and Savonarola (1480-97). Mendicant orders were established. The Inquisition was established in 1215.

The Modern Period, 1517 to the Present.—In the first quarter of the 16th century began the religious movement called the Reformation. Martin Luther, born in 1483, a priest and Au-

gustinian monk, began an agitation against the authority of the Pope. He published 95 theses, preached sermons, and in various ways sought to change the conditions which existed. He translated the Scriptures, and gained the cooperation of the German princes. Melancthon was the chief doctrinal writer of the Reformation. Erasmus labored in the department of New Testament criticism. The leading Swiss reformers were Zwingli in eastern Switzerland, and the learned Calvin in the western. Farel stood next to Calvin in Geneva. The English Reformation had King Henry VIII. on its side, through no pious motives, but because the Pope would not sanction his divorce from Catharine of Aragon. Protestantism grew rapidly, but received a set-back in Queen Mary's reign. Under Elizabeth the Reformation was placed on a firm foundation. The Puritans were a reaction against the old faith and practices in the Church of England. Arminius, born in 1560, in Holland, opposed the chief tenets of Calvinism. The Synod of Dort resulted in the political triumph of the Calvinists, and the expulsion of the Remonstrants, until the death of Maurice (1630). The Thirty Years' war (1618-48) was confined to the continent, and established the territorial boundaries of the Protestant and Catholic nations. The Huguenots were the representatives of Protestantism in France. The Jesuits, organized by Ignatius Loyola, 1540, were established as an offset to the aggression of Protestantism. Deism prevailed to an alarming extent in England, its chief promoters being Hobbes, Herbert, Shaftesbury, Tindal, Bolingbroke, Hume, and Gibbon. They had strong antagonists (Baxter, Cudworth, Taylor, Waterland, Leland, Butler, Paley). Methodism, begun by John Wesley, born 1703, was a fervent religious movement. Charles Wesley, Whitefield, John Fletcher, Joseph Benson, and Adam Clarke were strong coadjutors. German Rationalism arose in 1750, through the teachings of Wolfe, Semler, and the example of the Prussian court. It is now in decline, through the labors of Tholuck, Neander, Hengstenberg, Ullman, and others. The Evangelical Alliance (1846) sought to promote the unity of Protestant Christians in all parts of the world, and, to a corresponding degree, the victory over skepticism. The Old Catholics, a Roman Catholic reaction against the Vatican Council of 1869, were organized into a Church in 1870; Döllinger, Huber, and Friedrich were at their head.

The American Church.—The colonization of North America in some parts sprang from religious motives. The colonists sought freedom here because of the oppressions at home. Periods of American Church history: (1) From 1607-60, revival and progress. (2) 1660-1720, trial, disputes with Great Britain, religious decline. (3) From 1720-50, great revivals. (4) From 1750-83, political agitation, freedom from British rule. (5) From 1783 to the present, extensive revivals, separation of Church and state, abolition of slavery, evangelization. The Protestant Episcopal Church was founded by the James River Colony (1607); its first General Convention was in 1785; it ratified the 39 Articles in 1832. The Puritan Pilgrims landed at Plymouth in 1620, and began the development of Congregationalism. The Cambridge Platform was established in 1648. The Reformed

CHRISTIAN CHURCH

(Dutch) Church was established in 1628 in New Amsterdam (New York). The first independent organization was in 1771. The Baptists began in Providence, R. I., in 1639, through Roger Williams. The Reformed (German) Church was organized in 1741. The Lutherans were established first in New York in 1669; the first Synod was held in 1748. The Presbyterians were organized at the close of the 17th century. The first Presbytery was established in Philadelphia in 1706, and the first General Assembly in 1789. The first Methodist Society in the United States was established in New York in 1766, and the first Conference was held in Philadelphia in 1771. The Reformed Episcopal Church was organized in New York in 1873, under Bishop Cummins. The Roman Catholic Church in the United States was first established in Maryland through immigration in 1632. The Episcopal see of Baltimore was established in 1789. See CHRISTIANITY.

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Christian Church, The (in no way ecclesiastically connected with the "Disciples of Christ"*), a denomination in the United States and Canada, with missions in Japan and Porto Rico, desiring as individual believers to be known only by the name Christian, and as a collective body only as the Christian Church. In thus refusing all party, or sectarian names, they disclaim any thought of arrogating to themselves exclusive rights in the use of the name Christian, or any intimation that such as wear other names are not Christians. On the contrary, they welcome to their fellowship all the

* These two denominations are frequently mistaken, the one for the other, in many places the Disciples of Christ being called The Christian Church. This is due to an incident of the long ago. In 1833, or near that date, Rev. Barton W. Stone of the Christian Church and Rev. A. Campbell of the Disciples of Christ held a council, seeking to unite the two bodies. Finding it impracticable, they abandoned the effort, but the impression went out that union had been accomplished, and many of the Christian Churches accepted membership with Mr. Campbell's people, but would not give up the name Christian. Hence, where the original Disciples have established churches, they are called Disciples of Christ, and where the proselyted body has spread, they are called The Christian Church. For example, in Norfolk, Va., they are called Disciples of Christ, while in Richmond, Va., the same denomination is called The Christian Church, but they have no ecclesiastical affiliation whatever with the people represented in this paper. Some years later Mr. Stone united with the Disciples as an individual minister, but the two bodies have ever remained separate.—B.

CHRISTIAN CHURCH

children of God of whatever name. Horace Mann once said: "They call themselves Christians, not invidiously, but devoutly."

The origin of the Christian Church, as a modern organization, is at once most unique and without a parallel in ecclesiastical movements. It was born in the throes and upheavals of religious thought in the latter part of the 18th and the beginning of the 19th centuries, springing into existence in rather a spontaneous manner in three different sections of the United States, and in each section from a different school of religious thought, as follows:

1. *In the South, from the Methodists.*—At the Baltimore Conference, 1 Nov. 1792, now so famous in Methodist history, James O'Kelly, feeling aggrieved on account of the autocratic power exercised by the bishop over the ministers, led in a revolt, and was followed by 30 other ministers and a number of churches. Their action was primarily designed as a protest against this prelatic oppression. They therefore called themselves "Republican Methodists," as indicating the ecclesiastical liberty for which they were contending.

Facing the gravity of the situation, a general meeting was called to assemble with the Lebanon church in Surry County, Virginia, 4 Aug. 1794, for conference. A new organization was deemed a necessity under existing conditions. On motion of Rev. Rice Haggard the name Christian was chosen to the exclusion of all party or sectarian names. To this name, without a prefix or a suffix, they have steadfastly held to this day. Deprecating the evils of human creeds, they determined to take the Bible as their only confession of faith, with Christian character under the new birth, as their only test of church membership and Christian fellowship, giving to each individual the right of private judgment in all matters of mere opinion in theological discussion, not clearly fundamental in the Christian faith.

2. *In the East, from the Baptists.*—Human creeds, with power to bind the individual conscience, fettering religious thought, had greatly disturbed the Baptists of New England. There was a craving for religious liberty, and this was backed by enthusiastic and frequent outbursts of a determination to have it. Discussion led to disruption. Rev. Abner Jones, of Vermont, a man of much ability, led the movement. They organized their first church at Lyndon, Vt., 1 Sept. 1800. The new organization adopted the name Christian and practically the same principles as had already been adopted by the seceding Methodists in the South. Their Scriptural views and the unsectarian character of the movement drew to its support a number of the leading Baptist ministers of New England. The enthusiasm spread quickly through the East, then swept over Michigan and passed over the line into Canada. Great revivals followed their preaching, new converts were added to the faith and many churches were established. The new organization flourished.

3. *In the West, from the Presbyterians.*—In 1800-1, about the time of the Cane Ridge revival, decided doctrinal differences arose among the Presbyterians of Kentucky and adjoining States. Controversy and bitterness prevailed. Long settled doctrinal views were mercilessly

dissected. Barton W. Stone, a Presbyterian minister of ability, easily became the leader of the movement in the West. With him were associated many strong men and devout women. They, too, chose the name Christian and the Bible as their only rule of faith and practice. Their work spread rapidly through a number of the Western States.

The unique feature of this triple movement is the fact that each section, widely separated, both geographically and theologically, without a knowledge of what the other was doing, adopted the same name and practically the same principles, so that early in the 19th century, when they did learn, the one of the other, they came together as one body in Christ. The united body gave to the world what has become known in their history as their Five Cardinal Principles, as follows:

1. The Lord Jesus Christ is the only head of the Church.

2. The name *Christian* is the only appellation needed or received by the Church.

3. The Holy Bible, or the Scriptures of the Old and New Testaments, is a sufficient, and should be the only, rule of faith and practice.

4. Christian character, or vital piety, is a just, and should be the only, test of membership, or fellowship, in the Church of Christ.

5. The right of private judgment and the liberty of conscience is a right and a privilege that should be accorded to and exercised by all.

Under these principles they contend for the oneness of Christians and the blessings of orthodox truth in a wholesome evangelical toleration. Thus the "Presbyterians went into the water without becoming Baptists; the Baptists continued baptism without exclusiveness, and the Methodists fellowshipped both without becoming Calvinists." Conflicting elements were harmonized in the spirit of brotherly love, and the body speedily became one in Christ. It came, as if by magic, without apparent cause, without any concert of action, and without any human planning.

In the United States and Canada the Christian Church now has 72 annual conferences, with 1,500 ministers and 122,000 members, working under a congregational form of government. Their highest ecclesiastical body is the American Christian Convention, meeting quadrennially, composed of representatives from the 72 conferences. To this people belong the distinction of having published the first religious newspaper ever issued in the United States. Their new publishing house is located at Dayton, Ohio, where their oldest paper, 'The Herald of Gospel Liberty,' is yet published. They also publish 'The Christian Sun' at Elon College, N. C.; 'The Christian Messenger' at New Bedford, Mass.; 'The Christian Vanguard' at Kingston, Ontario, Canada; 'The Christian Missionary,' Dayton, Ohio; and 'The Christian Messenger,' Japan, besides a number of smaller periodicals and many books of permanent value.

The Christian Church was also the first to open their colleges to both sexes with equal privileges. They have colleges in Ohio, Indiana, Iowa, Kansas, Missouri, North Carolina, and New York. Their theological seminary, The Christian Biblical Institute, is located at Stanfordville, N. Y.

CHRISTIAN ENDEAVOR — CHRISTIAN KNOWLEDGE

They have missionaries in Japan and Porto Rico, together with many home missionaries in a number of States of the Union, and also in Canada. Their Mission rooms are located at Dayton, Ohio.

The Christian Church was divided over the issues of the Civil War. Separation took place in the National Convention held at Cincinnati, Ohio, in October 1854. The reunion was effected at Marion, Ind., in October 1890. After 36 years of separation they came together without a jar. They work under the motto: "*In Essentials, Unity; In Non-Essentials, Liberty; In All Things, Charity.*"

The general trend of the Christian Church in the fundamental doctrines of Christianity is Arminian. They believe in the Divinity of Christ, in the vicarious atonement, in the lost condition of the unregenerate, and in salvation through Christ. They believe in the Personality of the Holy Spirit, and in his endowment as the highest qualification for Christian service. There is an element in the Church which does not agree to this view in full. They hold to the Divinity of Christ, but deny that he is equal with the Father; they reject the vicarious atonement, but believe that the atonement is the reconciliation of the sinner to God through the death of his Son. "By his stripes we are healed, that is, reconciled — atoned." They hold that the death of Christ was not to make judicial satisfaction, but to secure the sinner's salvation and a ratification of the New Covenant, that it is moral in its nature, rather than propitiatory. This wing of the church denies the personality of the Holy Spirit, teaching that he is an influence proceeding from the Father and the Son for the convincing of the world of sin, of righteousness and of judgment. They as much depend upon the presence and power of the Holy Spirit to make their labors effective as do their brethren who accept his personality. The Spirit is thus honored in their lives and service.

As a whole the church stands for the divine inspiration of the Scriptures, and they recognize their authority as final in all matters of faith, practice, and doctrine. Baptism by immersion is largely practised among them, but pouring and sprinkling are also practised, and gaining in favor, rather than losing. They are open communion in the administration of the Lord's Supper. They steadfastly maintain that the Bible is their only creed, allowing absolutely nothing in the way of human expression of doctrine to displace this idea.

J. PRESSLEY BARRETT,

Member American Christian Convention Mission Board.

Christian Endeavor, Young People's Society of, a society distinctly religious in all its features; organized 2 Feb. 1881 in Williston Church, Portland, Maine, by the Rev. Francis E. Clark, D.D. From one small association it has expanded into over 57,000 societies, in all parts of the world, with an aggregate membership (1900) of 3,500,000. In addition to the main organizations in the United States it has been found necessary to form branches, among which are the Juniors, organized 27 March 1884, at Tabor, Iowa, by the Rev. J. W. Cowan and Miss Belle Smith; the Intermediate, organized by the Rev. A. Z. Conrad of Worcester, Mass.;

and the Mothers', suggested by Mrs. Amanda B. Fellows of Chicago, and organized in April 1893 at Topeka, Kan., by Mr. F. C. Barton. Among other special branches are the Life Savers', instituted by the Rev. S. Edward Young at the United States Life-Saving Station at Asbury Park, N. J.; the Travelers' Christian Endeavor Union, organized at Philadelphia, 14 Nov. 1892, for work among commercial travelers; the Floating societies for work in the United States navy and among seamen generally; and various other organizations whose fields of labor lie among the Chinese, the Indians, convicts in prison, etc. The first Christian Endeavor Society in England was organized in 1887, and was followed by similar ones in other countries, and the constitution has been printed in over 30 different languages. The movement is not a denominational one. Any society belonging to an evangelical Church, which adopts the leading principles as set forth in the constitution, including the prayer-meeting pledge, and which guarantees these principles by the name Christian Endeavor either alone or in connection with a denominational name is admitted to all the privileges of the organization. In the United States the Presbyterian Church has the largest number of societies; in England the Baptists lead; while in some parts of Canada and Australia the Methodists are in advance of all others. In some of the American States, the Disciples of Christ, and in others the Congregationalists, claim the largest number.

The distinctive features in the Christian Endeavor movement are its work among the young people, leading them to consecrate their lives to the active service of God; the weekly prayer-meetings, which each member takes a solemn pledge to attend regularly (unless unavoidably detained), and to take part in; and the reconsecration meetings held once a month, at which special efforts are made to see if each one has been faithful to his pledges. The amount of good accomplished in training the young people in the practical work of Christianity and fitting them to take up the work of those dropping out of active service can never be fully estimated. The World's Union of Christian Endeavor held its first triennial convention at Washington, D. C., in July 1896, which was attended by representatives from all over the world. Rev. Dr. Clark was elected president, and Rev. W. J. L. Closs of Australia was made the first secretary of the new organization. The United Society of Christian Endeavor is a bureau of information, which simply seeks to spread the idea of the movement throughout the world. Its headquarters are in Boston, and John Willis Baer is the secretary. FRANCIS E. CLARK.

Christian Era, the era or epoch introduced by the birth of Christ. It was calculated back about the year 532, by a monk, Dionysius Exiguus, a resident of Syria. It is thought that he fixed the advent too late by four years, and that consequently Jesus was born, if the contradiction in terms can be permitted, in 4 B.C. J. W. Bosanquet considers that it was in 3 B.C. The Christian Era is sometimes called the Dionysian era.

Christian Knowledge, Society for the Promotion of, the oldest and greatest of the great religious associations connected with the Church of England. It is popularly referred to as the

CHRISTIAN MISSIONARY ALLIANCE — CHRISTIAN REFORMED CHURCH

"S. P. C. K." It was founded in 1698, although it did not receive its present name till 1701; and had for its objects:

"1. To promote and encourage the erection of charity schools in all parts of England and Wales; 2. To disperse, both at home and abroad, Bibles and tracts of religion; and, in general, to advance the honour of God, and the good of mankind, by promoting Christian knowledge both at home and in other parts of the world by the best methods that should offer." These objects it has never ceased to pursue, chiefly directing its efforts to Great Britain and the colonies; partaking at once of the nature of an educational association, a missionary society, a Bible society, a religious tract society, and an emigrants' spiritual aid society; and notwithstanding the operations of other great societies in these several departments of Christian benevolence, its revenue amounts to above \$250,000 a year. The publishing and bookselling business shows in some years total sales of \$450,000; the works published being in very various departments of literature, and including several admirable series on Early Britain, Diocesan Histories, Ancient History from the Monuments, Early Chroniclers, etc.

The Protestant missionaries who labored in the south of India in the 18th century were supported chiefly by this society, and it is now chiefly engaged in supplying to the mission-field throughout the world needful religious literature in the vernacular. Besides translations of the Bible and Prayer-book, it provides for pioneer missionaries, grammars, dictionaries, reading-books, and general literature, to instruct them in the languages which they will have to use. In Scotland a similar society was organized in 1709, and in 1902 had an annual expenditure of \$25,000.

Christian Missionary Alliance. The Christian Missionary Alliance was the title adopted when the Christian Alliance, which had been founded in 1887, and the International Missionary Alliance combined in 1897. All who have made open profession of belief in Christ may become members by subscribing to the principles of the order and enrolling their names. The objects of the Alliance are "Wide diffusion of the Gospel in its fulness, the promotion of a deeper and higher Christian life and the work of evangelization, especially among the neglected classes in distant and especially heathen countries." Connected with the Alliance are the Missionary Training Institute, Institute for the Training of Home Workers, Berachah Home and Berachah Orphanage.

Christian Missions, Statistics of. At the close of the last century the world's evangelical foreign missions were reported as follows: Foreign missionary societies, 558; income, \$20,079,698; missionaries, 18,682; native workers, 79,396; stations occupied, 30,536; churches, 14,364; communicants, 1,550,729; Christian community, 4,523,564. There were 94 universities and colleges, with 35,539 pupils; 375 theological and training schools, with 11,965 pupils; 179 industrial schools, with 9,074 pupils; 18,742 elementary schools, with 904,442 pupils; making a grand total of 20,458 schools with 1,051,466 scholars. There were 159 mission presses and publishing houses, printing and publishing 379

magazines and papers, having a circulation of over 250,000 copies. The medical record reported 711 physicians, 379 hospitals, 783 dispensaries, and 2,347,780 patients; there were 247 orphanages, 100 leper homes, 30 schools for the blind and the deaf, 156 refuges for insane, opium-eaters, etc., and 118 societies for social reform. See MISSIONS, PROTESTANT FOREIGN; MISSIONS, PROTESTANT HOME; MISSIONS, ROMAN CATHOLIC CHURCH, HOME and FOREIGN.

Christian Reformed Church in North America, The. This Church is largely the result of three secession movements out of the Reformed (Dutch) Church (q.v.). The first of these movements took place in 1822 in the States of New Jersey and New York. Its leader was Rev. Solomon Froeligh, D.D., assistant professor of theology in the Dutch Church. The reasons advanced for seceding from the old denomination were: its laxness in disciplining offending members, indiscriminate administration of sealing ordinances, and toleration of Hopkinsian teachings. In 1827 the seceders, calling themselves the "True Reformed Dutch Church," numbered 25 congregations and 12 ministers. Their number dwindled slowly but surely until 1890, when they formed a union with the main part of the present Christian Reformed Church.

This main part was composed largely of Hollanders who, in 1847 and the decade following, had settled in Michigan, Wisconsin, Iowa, and other northwestern States. In 1849 these people — all staunch Calvinists — had united themselves with the (Dutch) Reformed Church. From the very beginning, however, some were dissatisfied with the union on account of difference in language, neglect of catechetical preaching and teaching, too much fraternizing with un-Calvinistic denominations, the singing of hymns, and laxity of doctrine. Objections were also made against allowing freemasons to be church members. In 1857 this dissatisfaction led to an open disruption. Under the leadership of the Rev. K. Vanden Bosch, about half a dozen churches in Michigan withdrew and styled themselves the "True Dutch Reformed Church." In 1876 they opened a theological school in Grand Rapids, Mich., the denominational stronghold.

This True Dutch Reformed Church was much strengthened, numerically and morally, by a third movement of secession which took place in the early '80's. This movement was the result of anti-Masonic agitation, the General Synod of the Reformed Church refusing to take such decided action as the complainants desired. In 1882 the seceding congregations, about half a dozen, led by Rev. L. J. Hulst, united formally with the Church which had withdrawn in 1857.

After this union the numerical increase of the denomination, which was slow at first, became quite rapid. The statistics for 1905 give 164 congregations, 119 ministers, 594 elders, 548 deacons, 12,209 families, 21,817 communicants, 21,229 catechism scholars, 16,309 Sabbath-school scholars; a total of 62,836 souls. These congregations are located in 18 States, from the Atlantic to the Pacific, from Canada to the Gulf of Mexico. The different local churches are joined in 10 "classes" or presbyteries. Six delegates of each of the latter, three ministers and three elders, constitute the Synod, the highest

CHRISTIAN SCHOOLS — CHRISTIAN SCIENCE

Church court of the denomination, meeting biennially (in even years), the third Wednesday in June. The theological school, including both a literary and a theological department, numbers about 150 students. The faculty is composed of 10 professors. The Christian Reformed Church is very zealous in home mission efforts. This is one of the main causes of its rapid growth; continual immigration from the Netherlands and the formation of new settlements supplying the material for the increase.

The denomination also carries on mission work among the Navaho and Zūni Indians in New Mexico. Near Gallup, N. M., "Rehoboth Mission," a promising boarding school for Navaho children, has been opened. Something is also done for Jewish missions. Four periodicals are issued in the interests of the denomination: one weekly, two monthlies, and one bi-weekly, the latter in English, 'The Banner of Truth,' published in Holland, Mich. Most of the Christian Reformed congregations are as yet using the Holland language in their religious exercises. Half a dozen conduct their worship in German, 18 are English-speaking churches, and the near future promises many more as a result of Americanizing forces. Fraternal relations are established with the stricter Calvinistic Churches of the United States and South Africa, and especially with the Reformed Churches of Holland. In creed and government the Christian Reformed Church is like all reformed denominations of Holland origin throughout the world, its creed consisting of the Heidelberg Catechism, the Belgic Confession, and the Five Articles against the Remonstrants, usually called the "Canons of Dordrecht." The Church is marked for its conservative spirit, and contends earnestly for Calvinistic tenets. It lays much stress on catechetical training of its young people. The Psalms are used almost exclusively in public worship. The name Holland Christian Reformed was adopted in 1880, and 10 years later the official name became "Christian Reformed Church."

REV. HENRY BEETS, S. C.

Christian Schools, Brothers of the.
See BROTHERS OF THE CHRISTIAN SCHOOLS.

Christian Science. For a definition of Christian Science it is sufficient to quote one that has frequently been used and which will be acceptable to Christian Scientists generally: "The foundational truths of Christian Science are the reality and allness of God, the unreality and nothingness of matter, the spirituality of man and the universe, the omnipotence of good, the impotence of evil. The demonstrative actuality of Christian Science essentially distinguishes it from all other religions of the age." As presented in 'Science and Health with Key to the Scriptures,' by Mary Baker G. Eddy: "The physical healing of Christian Science results now, as in Jesus' time, from the operation of divine Principle, before which sin and disease lose their reality in human consciousness, and so disappear as naturally and as necessarily as darkness gives place to light, and sin to reformation. Now, as then, his mighty works are not supernatural, but supremely natural. They are the sign of Immanuel, or 'God with us'—a divine influence ever present in human consciousness, and repeating itself, coming now again, as was promised aforetime,

To preach deliverance to the captives (of sense),
And recovering of sight to the blind,
To set at liberty them that are bruised."

(Preface, p. xi.)

Its purpose is not to supplant primitive Christianity, but to render our understanding of it more practical. It is the claim of Christian Scientists that Jesus proved what man may do through absolute reliance upon God, and Mrs. Eddy teaches how it may be done.

The principal mission of Christian Science is to give an enlarged spiritual explanation of the infinite personality of God as Spirit, to define the very nature and essence of God, and thereby increase mortals' faith and trust in Him. Christian Scientists believe that God should be recognized in all the affairs of men.

The history of Christian Science dates back to 1866, the year of Mrs. Eddy's discovery, and the growth of the movement during subsequent years has been so rapid that the denomination now commands a position of wide influence and power. Mrs. Eddy, the recognized discoverer and founder of Christian Science, began to win followers in 1867. In 1875 she published 'Science and Health with Key to the Scriptures,' the text-book of Christian Science, which has passed through more than 290 editions of 1,000 copies each. In 1879 she founded the first Christian Science Church, and in 1881 she opened a college for the teaching of Christian Science, called the Massachusetts Metaphysical College, where she personally taught about 5,000 students, who passed through this college. In 1883 she established the first denominational periodical and became its editor.

In Mrs. Eddy's personal history there is nothing mysterious or concealed. She has never made any miraculous claims. Her life has been simple, her girlhood, save for its eager religious questioning, not unusual. She was born in a little village in New Hampshire, sheltered by the hills that rose to the soft blue skies, and sentineled by oak and pine and hemlock.

She comes of that mixed English and Scotch Puritan ancestry which formed so much of the best of New England's stock. Some of her forefathers were men of mark in war and statesmanship. Gen. Knox, of Revolutionary fame, was a relative of her father, and among others of her ancestors were Sir John Macneil, who fought at Lundy's Lane. Mary Baker's father was a man of sturdy piety and strict probity. Of Mrs. Eddy's mother the little that has been recorded leaves the impression of one of those New England mothers whose strict notions of propriety were tempered by an innate sweetness of temperament. From her brother, Hon. Albert Baker, who was nominated for a congressman by the largest vote ever polled in New Hampshire (dying, however, before his election), Mrs. Eddy derived her knowledge of Greek, Hebrew, and Latin. Charity and benevolence ruled the household. Mrs. Eddy speaks of her childhood's home as "one with the open hand, where the needy were ever welcome." From such a family, and such a home, full of the beautiful simplicity of the rural life of early New England, came the only woman in history who has ever founded a great religious denomination.

Doctrinal questions early engaged her eager

CHRISTIAN SCIENCE

and active mind. In her book, 'Retrospection and Introspection,' she has described how she cast from her the doctrine of predestination, in which belief she had been carefully nurtured by her Calvinistic parents. Her soul revolted from what she regarded as the inhumanity of extreme Calvinism, and before the meeting, where she applied for church membership, she bravely disavowed a belief in those tenets. Thereafter she was active in church work, engaging in much speaking and writing. Three years she spent in Scripture study in the preparation of her work, 'Science and Health.'

Of this period she writes: "For three years after my discovery I sought the solution of this problem of mind-healing; searched the Scriptures, read little else; kept aloof from society, and devoted time and energies to discovering a positive rule. The search was sweet, calm, and buoyant with hope, not selfish nor depressing. I knew the principle of all harmonious mind-action to be God, and that cures were produced, in primitive Christian healing, by holy, uplifting faith; but I must know its science, and I won my way to absolute conclusions, through divine revelation, reason, and demonstration. The revelation of truth in the understanding came to me gradually, and apparently through divine power." ('Science and Health,' p. 109.)

The love in which Mrs. Eddy is held by Christian Scientists — and there is no mistaking the reality or genuineness of the affection — is called forth by what she has wrought, and goes out to her as the bearer of a great spiritual message. This is expressed in the speech and writings of Christian Scientists and is a constant tribute to the wisdom and success of her leadership. It is true that they regard her as the greatest woman of her time; considered in her relation to religious truth, the greatest of all time. But this is very different from fulsome adulation, or from the vulgar attribution of miraculous powers.

The total number of Christian Science churches and societies, here and abroad, in June 1903, was 769, showing the remarkable increase of 228 in three years. Greater New York has nine Christian Science churches; Chicago, six; Minneapolis, four; Milwaukee, three. The doctrines of Christian Science have secured a firm foothold in Great Britain and Germany, and the present indications are that the growth of the denomination in those conservative countries will be as rapid as in the United States and Canada. The directory of practitioners published in a recent issue of the official organ of the denomination includes the names of persons in 49 States and Territories of the United States, including Hawaii, the Philippine Islands, and Porto Rico; England, Ireland, Scotland, Wales, Canada, France, Germany, Italy, Switzerland, Australia, Mexico, China, and the Bahamas. Besides the churches there are many free reading-rooms — more than 450 in the United States alone. These reading-rooms are a feature of the denomination, and are to be found in many of the cities abroad where Christian Science has found lodgment.

The First Church of Christ, Scientist, in Boston, Mass., was finished in 1894 at an expense of over \$250,000 and was dedicated free of debt, in fact it was necessary to issue notice that no more contributions would be received. It is known as the "Mother Church," all the

other churches being branches of this one. This was the first church devoted to the uses of the denomination, and all the others have, therefore, been built within nine years, a very remarkable growth.

In recent years the growth of the congregation in attendance at the Mother Church has been so great that branch churches have been established in Roxbury, Cambridge, and Chelsea, but the relief thus gained has not been sufficient, and work has recently been commenced upon a larger building which will have a seating capacity of 5,000 and will cost over \$1,000,000.

The denomination, numerically, is very evenly distributed. The "Directory of Christian Science Practitioners" in 'The Christian Science Journal' shows that there is hardly a city in the Union but contains within it one or more adherents of the faith who devote their entire time to healing the sick. Then, too, the Board of Lectureship, comprising well-known and representative men and women, is a growing and efficient means of spreading a knowledge of the new doctrines.

The Mother Church in Boston included in June 1903, according to official figures, 27,796 members, 3,696 of whom had been added since the preceding June. Membership in this church is not confined to Christian Scientists residing in Boston.

The growth of the denomination has not been due to any effort on the part of Christian Scientists to proselyte from or misrepresent other denominations, but rather to the fact that the practical application of the teachings of Christian Science has proved beyond contention to thinking people who have investigated the subject that salvation is possible and within the reach of all who faithfully and earnestly strive for it. It is not the purpose of Christian Scientists to interfere with those who are satisfied with their religious beliefs, nor do they seek to force their views upon those who do not agree with them.

The nine years succeeding the building of the Mother Church have constituted a period of great activity and growth, especially in the way of church-building, and in many of the smaller cities and towns, as well as in the larger cities of the country, large and in some instances quite expensive edifices have been erected. It is an unwritten law of the denomination that a church building shall not be dedicated until it is paid for. Some congregations have built chapels to which they propose to add churches as the need arises; others have purchased old churches or family mansions, which they have remodeled and refurnished to meet their requirements, while a number have bought sites on which building operations will shortly be begun. In all this activity there is evidence of the great outlay of time, services, and money, which are given not only cheerfully, but eagerly; and all this has gone on at a steadily increasing pace, to which one can as yet see no probability of interruption. Early in 1904 there was in course of construction in Concord, N. H., a fine church edifice which represents a gift of \$120,000 by Mrs. Eddy to the Christian Scientists of her home city.

Organized Christian Science is perhaps less than seven years old in England. From 1894 to 1897 its meetings in London were confined to drawing-rooms, but in the latter year a regular meeting-place was engaged. But it was not until

CHRISTIAN UNION CHURCHES — CHRISTIANA CASE

1899 that First Church of Christ, Scientist, in London, was formed, followed later by Second Church of Christ, Scientist.

In Germany there has been some progress. Berlin has a church organized some time ago with the permission of the authorities, as is usual in such cases. In that city is a Christian Science reading-room maintained by the church organization. The question of the new faith came up in the Reichstag, and the imperial secretary of state then said: "I warn earnestly against using the power of the state against such things."

Wherever established, the Church numbers among its adherents men and women of distinguished intellectual ability. There as here, they are largely recruited from the professional ranks — judges, lawyers, doctors. Critics of the new denomination have frequently noted that the membership of the Church represents the "upper classes" — the classes which socially are near the apex, but while this is in some measure true, it is not to be understood that the Christian Science Church is "a rich man's church." On the contrary it is most democratic, and its members have been drawn from almost every rank and condition of society.

Practically all the adherents of Christian Science have been healed of severe and chronic sickness which in past years impoverished many of them or rendered the transaction of business and the earning of more than a meagre livelihood a physical impossibility. These people, now being restored, through the recovery of their health, to their legitimate place in the business and social world, give an air of prosperity to the congregations of which they are members.

A distinctive feature of the religious services of the denomination is the "Wednesday evening meeting" at which testimony is given by those who have been healed of physical disease or reformed from the practice of sinful habits, through the operation and practice of Christian Science. It is proverbial that every religious reformer has had to overcome prejudice and opposition, and in this regard the founder and leader of Christian Science is not an exception.

It should be remembered that there are no personal pastors in the Christian Science churches. This rule is observed with a view to the emphasizing of truth rather than personality. The place occupied in other churches by pastors is filled by trained and educated leaders called readers.

In the early years of Mrs. Eddy's work she met much opposition from those to whom it seemed impossible that the healing work of Jesus and the apostles should be revived, but this opposition and the prejudice from which it sprang is becoming less and less each year until Christian Science has now taken its place as a practical and beneficent religion, and it is so regarded by a constantly increasing and ever loyal constituency.

Certainly few teachings have made greater progress in the world than the faith to which the name of Mrs. Eddy is linked. Christian Science is no mere exclusive tenet, held by a small knot of believers. It is a growing and important faith, ranking in the number of its adherents with the great established denominations of Protestantism. Entertain what views its critics may of the basic doctrine advanced under the name of

Christian Science, certainly the charge of fanaticism cannot be in any way successfully maintained.

In a quiet, undemonstrative way its adherents have gone about their task; there has been no proselyting, in the usual sense of that term; there have been no sensational sermons, such as attract vast metropolitan audiences. With none of these adventitious aids to the spread of its doctrines, Christian Science has made extraordinary progress. It has moved like an army and, ere the world was aware of it, the great host had taken its place among the foremost of the established religious orders of the universe. Consult the works of Mrs. Eddy and the 'Christian Science Journal' (Boston).

ARCHIBALD McLELLAN,
Editor Christian Science Journal.

Christian Union Churches, an American denominational union, organized in 1865, composed of members of all varieties of orthodox belief. Their creed is simple, covering the headship of Christ, sufficiency of the Bible, and right of local Church government. They have a membership of about 30,000 and fully 150,000 adherents, and are located chiefly in the older western States. In 1899 they had approximately 183 ministers, and 294 churches. They are in affiliation with the Christians.

Christian University, a co-educational institution in Canton, Mo.; organized in 1853, under the auspices of the Disciples of Christ; reported at the end of 1905: Professors and instructors, 14; students, 183; volumes in the library, 2,800; grounds and buildings valued at \$40,000; productive funds, \$20,000; benefactions, \$3,000; income, \$5,000; number of graduates, 287.

Christian Woman, A, a novel by Emilia Pardo-Bazán. In this interesting tale the author presents a very realistic picture of modern Spanish life, into which are introduced many current social and political questions.

Christian Year, The, by John Keble, an English divine. The book is a small volume of religious poems, which first appeared in 1827. It contains a thought or thoughts, expressed in poetic form, for each day of the year. The poems have all the polish and simplicity which come from classical study and artistic workmanship. The book, at once, became popular, and has held favor ever since. Cardinal Newman said of this work: "It was the most soothing, tranquilizing, subduing work of the day. If poems can be found to enliven in dejection and to comfort in anxiety, to cool the over-sanguine, to refresh the weary, and to awe the worldly, to instill resignation into the impatient and calmness into the fearful and agitated, they are these." See KEBLE, JOHN.

Christiana Case. On 11 Sept. 1851, Edward Gorsuch of Maryland, his son, a party of friends, and a United States deputy marshal, having secured a warrant from a Philadelphia commissioner for the arrest of a fugitive slave (alleged to have been Gorsuch's own son), came to Christiana, Lancaster County, Pa., approached the house where the fugitive had taken refuge, and demanded possession of him, firing two shots at the house. The neighborhood was aroused, and several armed colored men appeared on the scene, as also did Castner

CHRISTIANCY — CHRISTIANITY

Hanway and Elijah Lewis, Quakers, who tried to persuade both parties to disperse. The deputy marshal ordered them to join his posse; they urged him to withdraw for his own sake; Gorsuch and two of his party fired on the colored men, who returned the fire, killed Gorsuch and his son, and forced the rest to fly. The fugitive slave escaped. The two Quakers were indicted for treason; the grand jury found bills against them; and they were tried 24 November before Justice Grier of the supreme court. Among the counsel for their defense were Thaddeus Stevens and T. L. Cuyler; the chief argument was by J. M. Read. The absurdity of the accusation was so great that the Democratic judge charged emphatically for the prisoners, and the jury acquitted them without leaving the box.

Christiency, Isaac Peckham, American editor and diplomatist: b. Johnstown (now Bleeker), N. Y., 12 March 1812; d. Lansing, Mich., 8 Sept. 1890. He was one of the founders of the Republican party and espoused its cause as editor of the 'Monroe Commercial.' In 1875 he was chosen United States senator from Michigan, and in 1879 became minister to Peru.

Christiania, krēs-tē-ä'nē-ā, Norway, capital, city and port, province Aggershuus or Christiania, at the head of the long narrow inlet called Christiania Fjord, about 60 miles from the open sea or Skager Rack. High hills rise around it on all sides, excepting toward the bay, but at considerable distances, particularly on the north. The most interesting building in the town is the fine old castle of Akershus (built about 1300), with its church and planted ramparts, crowning a point jutting out into the fjord, and commanding a fine view, but of no military value. On a gentle elevation, and in the midst of a beautiful park stands the royal palace—a massive square building, without any architectural ornament, but commanding delightful views of the fjord and its beautifully winding shores. The hall in which the Storthing holds its sittings is a very plain building. The other public edifices are the military academy, cathedral, university, etc. Attached to the university is a museum, containing a fine collection of antiquities. The climate of Christiania is delightful. It is screened from violent winds; and even in winter, though the cold is severe, the weather is seldom variable, but bright and settled, and free from damp and fog. In summer it is warm but not sultry, with a light and buoyant atmosphere. The few manufactures of the city consist of woolen cloth, iron-ware, tobacco, paper, leather, soap, spirits, glass, etc. There are also some extensive breweries. The exports are principally timber, deal planks, and iron. The environs of the city are exceedingly beautiful, the approach to it by the magnificent fjord, at the head of which it is situated, exciting the admiration of all visitors. The fjord is frozen for upward of two months in the year, for about 20 miles from Christiania to the sea; and the harbor is generally locked up for three or four months. Pop. 203,337.

Christianity. Christianity is a name for the religion which was founded by Jesus Christ. At first it was regarded as an heretical sect of Judaism, and, in appearance, it was little more.

Its Founder was a Jew who always spoke with respect of his ancestral religion, attended upon its worship, and revered its sacred books. Its earliest adherents were Jews who were devotedly attached to the traditions and customs of their people and who were far from supposing that in becoming disciples of Christ they were taking a step which would, at length, separate them from the religion of their fathers.

It is, indeed, a matter of dispute whether Jesus himself contemplated such a result. Some believe that he hoped to do the work of a reformer and to induce the Jewish people to adopt his religious ideals without separating himself or his disciples from the congregation of Israel. In all the circumstances this supposition seems improbable. The ritualism and traditionalism of late Judaism and the radical ethicism of Jesus were too diverse to admit of reconciliation. As he himself expressed it, his countrymen who were accustomed to the old wine of Jewish thought and custom would not straightway desire new, and his teaching was new wine which could not be confined in the old wineskins of Judaism (Luke v. 37-39). Accordingly, the separation which Jesus' experience at the hands of his countrymen had betokened, became more and more complete as time went on. The teaching of men who discerned and emphasized the contrast between Judaism and Christianity—especially that of the apostle Paul—the intense missionary spirit of the early Christians and the downfall of the Jewish state in 70 A.D., were among the circumstances which completed the separation of the two forms of faith and started Christianity on its career as one of the great world religions.

In speaking of the religion of Christ, we must refer primarily to his own teaching and that of his early disciples. This we may more properly do since all Christians agree that for obtaining a knowledge of the principles of their religion recourse must be had to the writings of the New Testament as being, in some sense, primary and normative. Despite the differences of opinion which have obtained in the Christian world, there are certain great, general convictions which Christians share in common and which may be said to underlie or constitute the claims of the Christian religion on its own behalf.

Chief among these claims is this, that the unique personality, teaching, and influence of Jesus Christ give to him a supreme place among the religious teachers of the world. All Christians would assert the incomparable elevation and excellence of the morality which he taught and illustrated, and would maintain that the influence of his example upon the life of the world has been most salutary. They would agree that a revelation of God is to be seen in the person and lifework of Jesus, however widely they might differ as to the method, nature, and scope of that revelation. It is a general Christian conviction that the moral effects of Christianity in the world have been such, on the whole, as to constitute an evidence of its divine origin and character. These introductory considerations must now be further elaborated.

Christianity and Christ.—How did Christ become the Founder of a new religion? We must answer: By the personal influence and inspiration which he exercised upon those who asso-

CHRISTIANITY

ciated themselves with him. He did not adopt the methods of the political organizer. He created no party; led no uprising; elaborated no formal programme. Other founders of religions have generally been the authors of elaborate books of rules and doctrines; Jesus wrote nothing. He was not an organizer or an aggressive leader of men. He advocated no revolution, except the moral revolution of the inner life. He moved quietly about along the highways and among the villages of Galilee and Judea, speaking to men about God and life and duty, and thus initiating a movement which has transformed the world.

The secret of this movement doubtless is that in his teaching and life Jesus touched the deepest chords in human nature. He sounded the profoundest depths of man's moral and spiritual being. The conception of God which he portrayed, the ideals of life which he illustrated, were the highest and truest of which men can conceive. Such has been the conviction which he has inspired. However far men might fall below the morality of Christ, however much they might deny his principles in practice, they have still been haunted by the feeling that his words were true. In the depths of their hearts men, despite their cruel selfishness, have recognized in the voice of Jesus the tone of absolute truth.

Our most primitive sources of information assure us that Jesus taught something regarding himself, as well as something regarding God and man. The Gospels assume that this latter aspect of his teaching is inseparable from the former. He assumed to speak to men about the fatherhood of God out of a sense of his own unique sonship to him. He told men what God was and required because he claimed to possess an incomparable knowledge of God's nature and will. If we can trust the earliest reports of his teaching, we must say that he never separated his message from his personal claims as the bearer of it. However unwarranted the historic theories of Christ's person may have been, they sprang from a legitimate impulse. The Christian religion implies and necessitates some theoretic estimate of Christ.

Christianity and Scripture.—Christianity has sometimes been described as the religion of a book. It would be more correct to say that it is a religion with a book. It is certainly not a book-religion in the sense in which Mohammedanism or Confucianism is. It does not appear, as it were, ready-made in the writings of any single sage or prophet. Its sacred books are its products, not its cause. Its programme was not first elaborated in a book and then carried out in life and action. Christianity did not begin with a body of rules or laws. It is, or, at any rate, originally was, a religion in which motives and principles are primary and whose nature it is to create its own externals.

Nevertheless, the conception that the religion of Christ had its chief source and warrant in a book has often been maintained, and still has a wide popular acceptance. A similar view prevailed in Judaism concerning the religion of Israel. The Mosaic law was believed to have had its origin in heaven and to have prescribed, by divine authority, the complete religious duty of man. This law was the antecedent warrant for all that was to be believed and practised. This conception of an authoritative book in

which the laws and principles of the system were incorporated in advance, was transferred to the earliest Christian writings and became the popular working theory of the subject.

Nothing is plainer, however, than that such a view, alike of the Hebrew and of the Christian Scriptures, is quite unhistorical. The Mosaic law was a comparatively late codification of rules and maxims which were developed and collated through a long period of time. In its present form it was later than the preaching of the great prophets whose teaching represents the high-water mark in Israel's religion. In like manner the writings which compose our New Testament were produced after Christianity had been, for a considerable period, a vigorous force in the thought and life of the world. Its oldest books, the earlier letters of Paul, were incidental products of his missionary activity. They were addressed to individuals, particular congregations, or groups of congregations, and deal largely with local conditions. They could not have been written with the remotest thought, on the part of the apostle, that he was contributing to an authoritative canon of Scripture. They were doubtless highly prized and carefully preserved by their recipients, yet not carefully enough to prevent several of them from being lost. At first they were not thought of as sacred Scripture—they were not placed on a level with the Old Testament, for example; that character they acquired only afterward when they became available in various controversies for the refutation of heresy.

We have reason to believe that the words of Jesus were sacredly treasured from the first and the various early efforts to preserve them in writing were the germs of the New Testament canon. They were probably preserved for a generation or more in oral tradition only and after various redactions and compilations took form in our present Gospels toward the end of the first century. Speaking broadly, then, we may say that the New Testament is the earliest available literary product and record of primitive Christianity and possesses unequalled historical and practical value because it acquaints us most closely with Christ and with the first effects of his work in the world. The New Testament contains the original documents of the Christian religion.

Its Theological Basis.—Christianity is one of the great monotheistic religions. In general, its theistic presuppositions were derived from Judaism on whose soil it took its rise. By its monotheism it is differentiated, at once from polytheistic religions, such as those of ancient Greece and Rome, and from pantheistic systems, such as Brahmanism and Buddhism. In common with Judaism Christianity rests upon the conviction of the personality of God. All those vague and infra-personal descriptions of the source and ground of all things which have been advanced as essentially equivalent to the Jewish and Christian ideas of God, such as "a power not ourselves" and a "stream of tendency," fall utterly short of the idea of God portrayed in the Old and New Testaments. Such philosophical terms as "ultimate reality" and "ground of the world" are useful, but noncommittal on the point of prime importance. Christians believe that the fundamental reality is Spirit; that the ground of the world is personal.

So far all Christians would theoretically

CHRISTIANITY

agree. When, however, we proceed to inquire as to the moral character of God, Christian speculation illustrates wide diversities of view. Men necessarily represent God to themselves by means of analogies drawn from their own life and experience. Hence in different ages, with their differing ideals and standards of life, various human analogies have been used to picture forth the nature and attributes of Deity. The Christian idea of the one personal God, at once gracious and holy, has, accordingly, varied in its form from age to age or within the same age among people of differing inheritance and culture. Now one aspect or attribute of his nature has been magnified, now another. But amidst all such divergences of emphasis, there has been a continuous and constant effort to conceive the character of God according to the highest ethical standards, and to represent him as embodying in himself all possible moral perfections.

Many modern Christian divines hold that the truest and most satisfying analogy with which to describe God is that which Jesus chiefly employed, namely, that of fatherhood. His favorite name for God was, the Father. The descriptions which he gave of the nature and action of the Father show that for him fatherhood meant original, self-imparting, all-embracing love. Hence the apostolic summary of the Christian doctrine of God: "God is love," is true to the thought of Jesus. The kindred formulæ: "God is spirit," that is, of a spiritual nature, as opposed to what is material and local, and: "God is light," that is, perfect purity and beneficence, emphasize special aspects of God as fatherly love. The specifically Christian idea of God is best expressed by saying: God is Father; God is love.

Christianity and Judaism.—Historically speaking, Christianity arose out of Judaism. Jesus declared that he had not come to destroy, but to fulfil, the law and the prophets. According to the Fourth Gospel he summarized the relations of his work and teaching to the religion of Israel by saying: "The (Messianic) salvation is from the Jews." There is no fundamental doctrine of Christianity the germs of which are not found in Judaism. Christianity presupposes the ethical monotheism, the views of the world and man and the ideals of righteousness which underlay the preaching of Israel's greatest religious teachers, the prophets. The New Testament uniformly regards the gospel as an unfolding, a development from the Jewish religion, and this view is amply justified by a critical study of both religions.

But are they, then, two different religions? Are they not merely two branches growing on the same stem? The differences appear by considering how much in Judaism Christianity discards. In Israel Church and State were one. The state had no existence except in and through its religious constitution. Israel's great peculiarity was that it conceived itself to be a theocracy, a people whose real king was Jehovah. Now Christ, in his teaching, entirely disregarded this civic organization of the forces of religion. His teaching was wholly ethical and spiritual. He framed no constitution, enacted no laws; he did not even formally provide for any outward organization. Many Christians, indeed, hold that the creation of a closely compacted organization, a new kind of theocracy, was implicit in the principles of Jesus and was

the legitimate and necessary outgrowth of his work; but however that may be, it cannot be shown that, in any direct way, he concerned himself with matters of outward organization and polity.

To the ritualistic system which was so prominent a feature of Judaism, Jesus only incidentally referred. As we have seen, he made no violent break with this system; it is a fair inference that he continued to attend upon the temple worship. But he laid no stress upon a ritual which had acquired increasing importance in the later history of Judaism, and even depreciated it. Like the Old Testament prophets, he does not commend sacrifices, but teaches that the most commonplace moral duty is more important. The most sacred rite of all, the badge of Israel's separation from the rest of the world, circumcision, he never even mentions. From such considerations it is evident that the gospel of Jesus is no mere reproduction of Judaism.

There are many other differences kindred to those which have been mentioned or growing out of them. Christianity is not, in the view of its Founder, a legal religion. It is a dispensation of inner, not of outer, law. In this respect its closest analogue in Hebraism is the teaching of the prophets. The New Testament writers see in the gospel the fulfilment of the prophecy that the new covenant should not be like the old; that the chief mark of the Messianic era should be that God would write his law on the heart. Hence Christianity finds its norm not in statutes, but in a personal life in which it beholds all its motives operative and all its principles illustrated.

The Relation of Christianity to Other Religions.—The principle which the Founder of Christianity announced when he said that he had not come to destroy but to fulfil, was not applicable solely to Judaism. Jesus recognized goodness and truth under whatever form of religious belief or practice it might be found. While it is true that he saw in Israel's life and history a unique revelation of God and recognized in the Jewish Scriptures the product and record of that revelation, it is also true that he found a revealing and saving activity of God outside Judaism. He could see in the nobility and generosity of a heathen soldier a faith not matched in all Israel. He had other sheep who were not of the Jewish fold whom he would bring into the one flock. In the opinion of many interpreters the judgment parable in Matthew xxv. is intended to describe the testing of the heathen, many of whom are accepted because they have shown the spirit of love and service; having done kindness to Jesus' fellowmen, they are regarded as having done it unto him.

The primitive Church more or less fully apprehended this conception of the relation of the gospel to other forms of religion. Raul declared that God had not left himself without a witness among any people; that he had made of one blood all nations of men; that the Greeks had been seeking after God and that there was a law of God written on the hearts of all men. The apostle recognized elements of truth in the crude beliefs and worship of the heathen. Despite their ignorance, he saw in their more than ordinary religiousness an evidence of a sincere aspiration after God and in their devotions and moral judgments a proof of their native kinship to him.

CHRISTIANITY

These views obviously rest upon the conception that, in some real sense, revelation is universal. God's eternal power and divinity are known to mankind, says Paul, because God has made these truths known to them. Other New Testament writers teach the same in other terms. In the Fourth Gospel Christ is identified with the Logos of Greek speculation. Accordingly in his preincarnate activity he is conceived as the medium of a universal revelation. Like an eternal sun he has been shining down into the world's darkness and sin, enlightening the mind of every man. He was operative in the life of Israel of old, however blind this favored people may have been to his presence. Paul expresses allegorically the same thought when he says that the spiritual rock of which the Israelites drank in the wilderness was Christ. But this action of the pre-existent Christ was not exceptional. He was the light of men universally. "His writing is upon the wall, whether of the Indian fane, or of the porticos of Greece" (J. H. Newman). From these various forms of thought and of expression it is seen that Christ and the early Christian teachers recognized truth in other religions than Judaism and Christianity and regarded the teaching and work of the Founder of the Christian religion as a clarification and completion of such truth. Christianity builds on the constitutional religiousness of man, upon his native and persistent sense of God, which it aims to enlighten and to quicken into a rational, moral faith.

The Doctrinal Contents of Christianity.—What has been said concerning the early history of Christianity, its monotheism, and its estimate of Christ, may serve as a point of beginning for a somewhat fuller illustrative statement of its doctrinal contents. As we have seen, Christianity inherited the monotheism of Israel, but gradually developed it by the elaboration of the doctrine of the Trinity. The motives to this development were chiefly two: (1) the primitive Christian estimate of the person of Christ, and (2) the Biblical teaching regarding the Spirit of God. Instead of conceiving of God as a simple, distinctionless essence, speculative thought began to analyze the divine nature until in the 4th century an elaborate theory of a threefoldness in God appears. In this Nicene or Athanasian form of thought God is said to consist of three persons, Father, Son, and Holy Spirit, all equally eternal, powerful, and glorious. It was held that this tri-personality of God is not inconsistent with monotheism, since the Father is the *fons et origo* of Deity from whom the Son and Spirit are derived by an eternal process of generation, and because the divine Essence is one. The doctrine thus included these three elements: (1) the co-equal eternity of the three persons; (2) the subordination and derivation of the Second and Third from the First; and (3) the consequent oneness of the divine Nature in which all three persons alike partake.

It would carry us beyond the purpose of this article to dwell upon the various arguments and analogies by which it was sought to illustrate the nature of this tri-unity in God, or to describe the varying types of theory which were elaborated in subsequent theological discussion. Those who desire to pursue the subject further can do so by the aid of such standard treatises

as Neander's or Milman's 'History of the Church,' or Fisher's 'History of Christian Doctrine.' The various forms of Trinitarian belief are sketched and discussed in Prof. L. L. Paine's 'Evolution of Trinitarianism.'

The orthodox doctrine of incarnation was that the Son, the second person of the Trinity, united himself with "human nature"—sometimes defined as impersonal, sometimes as personal. "Two whole, complete natures in one person," was the formula. In modern times these definitions have been modified or rejected by those who have adopted a different philosophy of the Trinity from that on which the definitions proceed.

Amidst the many diversities of opinion and theory the great common conviction of all Christians is that Jesus Christ is the supreme Revealer of God and the Saviour of men. The manner in which he effects their salvation has been variously explained and illustrated according to the conceptions entertained at different times of the ethical character of God. But whether Christ was believed to have paid a debt of honor to God or to have experienced a vicarious punishment for us, or to have safeguarded the divine government, or to have furnished a supreme example and incentive to goodness—in all these and other theories of atonement he is recognized as the Way to the Father.

These few statements respecting three great doctrinal topics may serve as illustrations of the historic theories which have been, in some cases, sanctioned by ecclesiastical authority, and, in others, rendered almost equally binding by tradition, and of their modification by the application to them of modern historical and philosophical methods of investigation and thought.

Its Ethical Character and Requirements.—While, officially considered, Christianity has had the character of a doctrinal system, with its authorized theories and binding beliefs, practically its chief value and power have lain in its ethical teachings and influence. Theologians have placed great stress upon the various formulas and definitions which have been elaborated from time to time, but of these the vast mass of Christians have never had more than the vaguest knowledge. Dogmatists have often held that Christianity was primarily a body of officially defined doctrines, but for most believers it has certainly not been such but rather a series of moral duties and requirements—a certain line of action or kind of life.

This view of Christianity is more germane to the teaching of Jesus than the dogmatic view. He promulgated no creed, elaborated no system, championed no set of formulas. His teaching was doctrinal in the sense that there underlay it certain conceptions of the moral nature of God and man and a certain view of their relations. But Jesus advanced no such technical theories on these subjects as were developed in later Christian thought. Metaphysics, in general, was foreign to the Jewish mind. Hence the teaching of Jesus naturally moved wholly in the ethical sphere. His teaching about God concerned itself almost wholly with the moral character and disposition of God. This character he illustrated by practical, human analogies.

Jesus' favorite name for God, as we have seen, was "Father"; that is, original, creative,

CHRISTIANITY

and sustaining love. In that conception of God the whole ethical character of his religion is rooted. The Father delights to give, to serve, to bless. He bestows his benefits upon all, even the evil and unthankful. He freely forgives, upon repentance, not only "until seventy times," but "until seventy times seven." Now, the primary requirement of Christianity is that men should be like God; or, as Jesus expressed it, that they should be sons of their Father; that is, morally kindred to him in spirit and action. Jesus represented himself as having come into the world to reveal God in this character and perfectly to illustrate in himself the Godlike type of life. He would be servant of all; he came to minister and to give his life for others. His followers must do the same. They must take up his cross of sacrifice and self-renunciation and follow after him. As he laid down his life for men, so must they lay down their lives for one another.

With all its faults and failures, despite its divisions and bitter enmities, Christianity has done much to leaven the world with the spirit which its Founder thus described and enjoined. It has cared for the sick and the poor, instructed the ignorant and sheltered the helpless. To education, to literature, and to art the Christian religion has imparted a powerful impulse. No impartial student of history can question the great contribution which Christianity has made to human progress in culture and philanthropy.

Its Various Forms.—The theological controversies of the early Christian centuries, together with the political rivalries of Rome and Constantinople, finally rent the Church into two divisions, the Western or Latin, with the Bishop of Rome as its head, and the Eastern, in which the Patriarch of Constantinople was the chief dignitary. Out of the same controversies also grew a number of sects and national Churches which still survive, such as the Coptic, Ethiopic, and Armenian. Down to the Protestant Reformation in the 16th century the two chief forms of Christianity were the Oriental, now represented by the Greek and Russian Churches, and the Roman Catholic. In the West the claims of the papacy were gradually increased until the pope rivaled in political power the greatest European emperors. There was no corresponding development in the East, where the Church became more and more dependent upon and subservient to the states with which it was allied. The Eastern Church was differenced from the Western by a more speculative and less practical tendency, the favorite themes in the theology of the former centring in the doctrine of the Trinity, those of the latter having more largely to do with sin and salvation. Both developed an elaborate ceremonial of which the mass is the central feature.

At the Reformation, or in consequence of its influence, the various divisions of Protestantism arose. Some of these, for example, the English Church, continued in alliance with the state; others repudiated any such connection. The Church of England retained the Episcopal system and laid increasing stress upon its continuity in organization with the Church of apostolic days. Most Protestant communions rejected this order along with other features of the Roman organization, and attached no importance to the question of so-called tactual

succession. Among these the greatest variety of belief and practice prevails.

It is quite impossible adequately to characterize in a brief statement the various forms of belief and life which the Churches and creeds of Christendom illustrate. In general, it may be said that the Roman type represents a highly elaborated authoritative system. The decrees of popes and councils are binding, and, indeed, within certain limits, infallible. There is a highly developed and minutely defined system of dogma and an elaborate ritual. Great stress is laid upon the prescribed rites of the Church and upon priestly mediation. Salvation is mediated through the sacraments, which are seven in number. In the English Church we see an intermediate form. Its head is not the pöpe, but the king. In general, it highly esteems the decrees of the early councils and lays great stress upon the (two) sacraments, but, in practice, does not compel the unquestioning acceptance of the former, nor regard the latter as essential to salvation. Most other Protestant bodies, such as Baptists, Congregationalists, Methodists, and Presbyterians, permit and exercise a larger liberty regarding traditional beliefs and rites, some of them, as the two former, having no general authoritative creed, others, as the two latter, allowing considerable liberty in the interpretation of their official articles of belief. In general, it may be said that in Protestantism the prevailing tendency of thought is to regard Christianity as not being a system which can be embodied in rules and enforced by laws, but as a religion whose nature it is to attest itself to reason and conscience by its moral appeal to the human mind and heart.

The Essential and the Transient in Christianity.—What facts and truths constitute the essence, the permanent substance of Christianity? That is a difficult question and one which Christian thinkers would answer in the most various ways. Certain it is that in its long history Christianity has undergone many transformations, been influenced by a great variety of foreign forces and taken up into itself many incongruous elements. In its Roman Catholic form it blended with the Roman imperial idea. In its most elaborate developments of dogma it wrought in close alliance with Greek philosophy. Some of its doctrines have been examples of a Christianized Platonism. Are these features of historical Christianity essential to it?

The same question meets us if we go back to the Church of the first age. The common view has been that every idea which is found in the New Testament is of the essence of Christianity; but this supposition is not without its difficulties, and was probably never consistently carried out in practice. Were the apocalyptic expectations of the first Christian century valid and essential—the universal belief in Christ's speedy personal return to earth to judge the world, the confident anticipation of Rome's early destruction, and the like? A close study of early Christian history reveals the fact that the admixture of foreign elements with primitive Christian teaching was not limited to the later ages of the Church. Christian doctrine had already undergone a considerable development within the New Testament period. Greek ideas and, especially, late Jewish theories and speculations, must be taken into account in interpreting

CHRISTIANS — CHRISTIE

and estimating apostolic and post-apostolic teaching and tradition.

If Christianity be regarded as a certain kind of life—if it be conceived as sonship to God, membership in the kingdom of the Godlike—then we cannot say that any one particular form of church organization is essential to it. True Christianity is formed within all these forms of organization. Except in some purely human, arbitrary definition of it, it cannot be truly said that divine grace is the special prerogative of any one of them. Nor can any theory or practice concerning the sacraments, or other rites, be essential. A vast range of speculative dogma, though often insisted upon as essential to salvation, can hardly be a constituent part of Christianity, since the vastly greater part of the Christian world knows nothing of it.

Christ never emphasized organization or ceremonies, or dogmas. His great words were love, righteousness, sonship to God, and the like. He said that all ritual observances were trifling in comparison with judgment, mercy, and the love of God; that he who had wronged a brother might better leave his sacrifice unoffered and go and right the wrong; that love to God and man was the substance of all laws and commandments; and his life was the perfect commentary on these sayings. It was that of an obedient, trustful son of God. His one chief concern was to found and foster the kingdom of God; that is, the reign of love among men. For this end he labored, suffered, and died, and taught that his followers must follow him on this path of service and sacrifice. To live the kind of life he lived is the essence of Christianity. See CHRISTIAN CHURCH.

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Christians of St. Thomas, the name of a sect of Christians on the coast of Malabar, in southern India, to which region the apostle St. Thomas is said (by a tradition that has little to justify it) to have carried the gospel. The facts of their history are not well made out. They originally belonged probably to a body of Christians who, in the year 499, united to form a Syrian and Chaldaic Church in eastern Asia,

and who were adherents of the doctrines taught by the heretic Nestorius. At an early date (7th century) the Persian Church had adopted the name of Christians of St. Thomas, and the Christians of Malabar received bishops from Persia. Latterly the Christians of St. Thomas gained the position of a military caste which locally had considerable power. When the Portuguese gained a position in Malabar these Christians were forced to join the Roman Catholic Church (1599). But in 1653 many of them renounced this union, and having in 1665 received a bishop sent by the patriarch of Antioch, they have since belonged to the Jacobite body of eastern Christians. The Church is now under seven bishops with a patriarch at the head; and the adherents number about 300,000. They give communion in both kinds, and in some other matters differ from the Roman Catholic Church. They allow the consecration of a married layman or deacon to the office of priest. Their churches contain no symbols nor pictures except the cross. Their liturgy is similar to the Syrian, and the Syrian language is used in it. At present they are, under the British government, free from any ecclesiastical restraint, and form among themselves a kind of spiritual republic, in which the priests and elders administer justice, using excommunication as a means of punishment. See 'The Indian Empire,' by Sir W. W. Hunter.

Christiansand, krīs'tē-än-sänd, Norway, a city in the southern part of the country, situated on a sandy plain. It was built by Christian IV. in 1641; and has been the capital of its province or stift since 1684. It has several dockyards, a good harbor, much used for refuge, and a considerable trade in timber, pitch, stockfish (salted cod), fish-oil for curriers, salmon, mackerel, and lobsters, the latter chiefly for the London market. Shipbuilding is a considerable industry. Christiansand has a cathedral and grammar-school, and is the residence of a bishop. The streets are wide, straight, and regular; the houses are built of wood and detached, presenting altogether a remarkable colonial appearance. Pop. 13,000.

Christianstedt, krīs'tī-an-stēt, Danish West Indies, a seaport in the island of Santa Cruz, situated on the north shore. The harbor is difficult of access, being encumbered with many shoals, one of which stretches out nearly two miles to seaward in a northeasterly direction. This city is the capital of the Danish West Indies. Pop. 9,600.

Christiansund, Norway, a seaport on the northwestern coast, capital of the bailiwick of Romsdal, 82 miles southwest of Trondhjem, on three islands, which enclose its beautiful landlocked harbor. The trade of the place is considerable, and the principal export is dried cod, chiefly for the Spanish and Italian markets. The town was founded in 1734 by Christian VI. of Denmark. Pop. (1900) 12,050.

Christie, James, English clergyman: b. Otterburn, Northumberland, 14 July 1837. He was the son of a Presbyterian pastor at Otterburn, whom he succeeded in the pastorate in 1862, and since 1870 has been pastor of the Fisher Street Presbyterian Church at Carlisle. He has held several important professional posts.

CHRISTIE — CHRISTINA

being moderator of the Presbyterian Church of England in 1901, and has published 'Men and Things Russian'; 'Northumberland'; 'The Moderator's Wander-Jahr.'

Christie, James Elder, Scottish artist: b. Guardbridge, Fifeshire, 5 Jan. 1847. He received an art training at South Kensington, and the Royal Academy. He was awarded a gold medal at South Kensington in 1875, and another from the Academy in 1877 for historical painting. Among important works by him are 'Tam O'Shanter' (1879); 'Pied Piper of Hamelin' (1881); 'A Lion in the Path' (1888); 'The Four Maries' (1889); 'The Red Fisherman' (1893); 'Gather Ye Rosebuds.'

Christie, Richard Copley, English scholar: b. Lenton 22 July 1830; d. Ribsden 9 Jan. 1901. He was educated at Oxford, studied law and practised his profession 1857-77. He was professor of political economy at Owens College, Manchester, 1854-66, and was chancellor of the diocese of Manchester 1872-94. After retiring from his profession he gave much time to bibliographical research, and besides contributing to the 'Dictionary of National Biography' he published 'Étienne Dolet, the Martyr of the Renaissance' (1880); 'Old Church and School Libraries of Lancashire' (1885); 'Letters of Sir Thomas Copley.' He gave to Owens College the Christie Library, opened in 1898, and at his death bequeathed his library of 75,000 volumes to the same institution. See 'The Athenæum,' 19 Jan. 1901.

Christie, William Henry Mahoney, English astronomer: b. Woolwich 1 Oct. 1845. He was a graduate of Trinity College, Cambridge, and for a long time assistant in the Royal Observatory of Greenwich. On the retirement of Airy (q.v.) as astronomer royal in 1881, Christie was appointed his successor, a position which he still holds. He has written a 'Manual of Elementary Astronomy' (1875), but is best known for his spectroscopic work with the Greenwich Equatorial, especially that relating to the motion of stars in the line of sight.

Christie Johnstone, a story by Charles Reade, published in 1855. The story, by turns pathetic and humorous, abounds in vivid and dramatic scenes of Scotch life by the sea.

Christina, krīs-tē'na, queen of Sweden: b. Stockholm 9 Dec. 1626; d. Rome 19 April 1689. She was a daughter of Gustavus Adolphus, and her education was conducted in a masculine manner. After the death of Gustavus in 1632 the States-General appointed guardians to the Queen Christina, then but six years old. These were the five highest officers of the crown, who were intrusted at the same time with the administration of the kingdom. The education of Christina was continued according to the plan of Gustavus Adolphus. She learned the ancient languages, history, geography, politics, and renounced the pleasures of her age in order to devote herself entirely to study. In 1644 she took upon herself the government. A great talent for business, and great firmness of purpose, distinguished her first steps. She terminated the war with Denmark, and obtained several provinces by the treaty concluded at Brömsebro in 1645. She then, contrary to the advice of Oxenstiern, who hoped to gain, by the continuance of the war, still greater advan-

tages for Sweden, labored to re-establish peace in Germany, in order to be able to devote herself uninterruptedly to the sciences and the arts of peace. France, Spain, Holland, and England sought her friendship. She promoted commerce by wise legislation, and patronized the learned and literary institutions. She declined to marry her cousin, Charles Gustavus, but induced the States-General in 1649 to designate him for her successor. In 1650 she caused herself to be crowned with great pomp, and with the title of king. From that time she neglected her ancient ministers, and listened to the advice of ambitious favorites. The public treasure was squandered with extravagant profusion. Distinctions were conferred upon the undeserving, and jealousy produced murmurs, complaints, and factions. In this state of confusion the queen declared her intention of abdicating the crown. The old ministers remonstrated with so much energy that the queen desisted from her resolution. She now grasped with more firmness the reins of government, and occupied herself again with study, bought paintings, medals, manuscripts, books, maintained a correspondence with many learned men, and invited several to her court. Descartes, Grotius, Salmasius, Bochart, Huet, Chevreau, Naudé, Vossius, Conring, Meibom, appeared in Stockholm, and the queen conversed familiarly with them on literary and philosophical subjects. But new troubles occurred; and Christina, who loved whatever was uncommon, resumed her determination to resign the crown.

In 1654 she assembled the States-General at Upsal, and in their presence laid aside the insignia of royalty to surrender them into the hands of Prince Charles Gustavus. She reserved to herself a certain income, entire independence, and full power over her suite and household. A few days after she left Sweden, and went to Brussels, where she made a secret profession of the Roman Catholic religion, which she afterward publicly confirmed in Innsbruck. From here she went to Rome, which she entered on horseback in the costume of an Amazon, with great pomp. When the Pope Alexander VII. confirmed her she adopted the surname of ALEXANDRA. In 1656 she visited France, where her dress and manners produced an unfavorable impression, but her talents and knowledge were generally admired. She offered to mediate between France and Spain; but Mazarin declined the offer, and succeeded in accelerating her departure from France under various pretexts. After the death of Charles Gustavus in 1660, the queen made a visit to Sweden, under pretence of wishing to arrange her private affairs; but it was soon perceived that she had other views. As the crown-prince was very young, she declared that in case of his death she should lay claim to the throne. This project was unfavorably received and she was compelled to sign a formal act of abdication. About this time she aspired to the Polish crown, but the Poles took no notice of her wishes. Finally she returned to Rome, where she passed the remainder of her life in the cultivation of the arts and sciences, giving way at times to fits of sensual indulgence. She was interred in the Church of St. Peter, and the Pope erected a monument to her with a long inscription. She had asked only for these few words: *Vixit Christina annos LXIII.*

CHRISTINA — CHRISTMAS ISLAND

Christina, Maria, queen of Spain, daughter of Francis I., king of the Two Sicilies, and mother of Isabella II., the dethroned queen of Spain: b. Naples 27 April 1806; d. Havre 22 Aug. 1878. She was married to Ferdinand VII. in 1829, and took an active part in the affairs of Spain from 1830 to 1854. As queen-regent she governed arbitrarily, and in 1854 she abdicated.

Chris'tison, Sir Robert, Scottish physician and toxicologist: b. Edinburgh 18 July 1797; d. 23 Jan. 1882. He was graduated in medicine at Edinburgh University in 1819, and subsequently studied in London and Paris. He was appointed to the chair of medical jurisprudence in Edinburgh in 1822, shortly after his return to Scotland, and in 1832 was promoted to those of materia medica and clinical medicine, but resigned them in 1877 and 1855, respectively. He was twice president of the Royal College of Physicians, president of the Royal Society of Scotland, and ordinary physician to the queen in Scotland. He was created a baronet in 1871. The most important of his published works is his 'Treatise on Poisons' (1829); but he also wrote 'Granular Degeneration of the Kidneys' (1839); and a commentary on the 'Pharmacopœias of Great Britain' (1842).

Christlieb, Theodor, German theologian: b. Bukenfeld, Württemberg, 7 March 1833; d. Bonn 15 Aug. 1889. He studied at Tübingen, after which he taught for some time in France. Upon his return to England, in 1858, he began preaching in London, where his famous lectures on 'Modern Doubt and Christian Belief' were later published. After a stay of seven years in London, in 1865 he returned to Germany, and subsequently, in 1868, became professor of theology at Bonn. In 1873 he was sent to the United States as a delegate to the Evangelical Christian Alliance, then convened in New York, and delivered a lecture before that body on rationalism. Prominent among his publications are: 'Leben und Lehre des Johannes Scotus Erigena' (1860); 'Modern Doubt and Christian Belief' (1874); 'Protestant Foreign Missions: Their Present State' (1880); etc.

Christmas, the feast of Christ's birth, observed by the Christian Church annually on the 25th of December. It was, according to many authorities, not celebrated in the first centuries of the Christian Church, as the Christian usage in general was to celebrate the death of remarkable persons rather than their birth. The death of the martyr Stephen, and the massacre of the innocents at Bethlehem, had been already long celebrated, when, perhaps in opposition to the doctrine of the Manichæans respecting the birth of the Saviour, a feast was established in memory of this event in the 4th century. In the 5th century the Western Church ordered it to be celebrated forever on the day of the old Roman feast of the birth of Sol, though no certain knowledge of the day of Christ's birth existed. Among the German and Celtic tribes the winter solstice was considered an important point of the year, and they held their chief festival of Yule to commemorate the return of the burning-wheel. The holly, the mistletoe, the Yule log, and the wassail bowl relate more to paganism than to Christianity. In the East Christmas was celebrated on 6 January. As

told in the Gospel of St. Luke, Christ was born during the night, and therefore divine service was performed in the night of 24-25 December, from which circumstance Christmas is called in German *Weihnachten*, a contraction of the old German *ze wih nahten*, on the holy or consecrated nights. The feasts of the martyr Stephen and the evangelist St. John were united with it, and a feast of three days' continuance was thus formed. In the ecclesiastical year this festival gives name to a period extending from the first Sunday of Advent to the feast of Epiphany, 6 January. In the Roman Catholic Church priests are allowed to celebrate three masses against the rule which prevails every other day in the year. In the Greek and Roman Catholic churches the manger, the holy family, etc., are sometimes represented at large. Most Christian churches celebrate this great festival in some way, and practically the entire community in Christian countries, including Jews and non-churchgoing people nominally classed with Christian populations, join in its social observance. In the United States, England, and other countries business is commonly suspended, although in Scotland this is only partially the case. The custom of making presents at Christmas is derived from an old heathen usage; but it has become consecrated by ages, and contributes greatly to make this festival an interesting event to families. The sending of Christmas cards by way of friendly greeting and remembrance has grown up within a period of some 50 years. The Christmas-tree has been traced back to the Romans. It went from Germany to Great Britain, and is almost universal in the United States, where the customs of so many nationalities meet and gradually blend into common usage.

Christmas-box, a box containing a present at Christmas; hence a Christmas gift. The custom of bestowing Christmas-boxes arose in the early days of the Church, when boxes were placed in the churches for the reception of offerings; these boxes were opened on Christmas Day, and their contents distributed by the priests on the morrow. In England the giving of Christmas-boxes led to the popular observance of what is called *Boxing-day*; that is, the first day after Christmas, when presents are made by the well-to-do to servants, messengers, and persons of humble condition.

Christmas Carol, a song in celebration of Christ's birth, sung especially at Christmas-time. Such carols, as well as many of a more secular but always joyous nature, have been long popular among the people of many nations. In France they are known as *noëls*, and various good collections of them have been published from time to time. Consult: Sandys, 'Christmas Carols, Ancient and Modern.'

Christmas Island, the name given to three oceanic islands, of which the most important is situated about 250 miles south by east of the western extremity of Java. This island, which is supposed to have been originally a coral atoll, and to have been raised by volcanic forces, rises to the height of nearly 1,600 feet, and is in shape an irregular quadrilateral of about 30 miles in circumference, having an area of about 20 square miles. It was annexed by Great Brit-

CHRISTOLOGY

ain in 1888, and a settlement has been formed on it for the purpose of developing beds of phosphate.

Christology is that branch of Revealed Theology which treats of the Person of Jesus Christ, giving specific consideration to his Deity, his Humanity, and their Union in their relation to the redemption of the world. The scope of the subject embraces the individual features of his pre-existent life, his creative genius, his manifest interest in theocratic times, his incarnation, his subjective position in his salvatory work, and his immediate personal supervision over and presence with the Christian Church of to-day. In following these different correlative details as they enter into an outline of Christology, it is most convenient to separate them into three general divisions: I. The Biblical; II. The Historical; III. The Ethico-Practical.

I. BIBLICAL CHRISTOLOGY.

Biblical Christology begins with the two thousand or more direct prophetic statements of the Old Testament, running as far back as the earliest Mosaic records in Genesis, continuing throughout the history of the Jewish nation within the range of its civil and religious life as promulgated in theistic utterances, direct covenantal relations, manifestations of power, legislative enactments, and ritualistic observances; and finding judicious and unimpeachable endorsement in the prophecies of the great seers who proclaimed, in unison, *Yahveh—He who will be*—whose identity with the New Testament Christ is no longer a disputed fact.

In the New Testament writings, the doctrine of Christ's Person has infallible expression. Both the Synoptic and Johannine books declare that Jesus was born with divine-human natures. Paul's epistles support this view with the unequivocal arguments of sense and with the logic of metaphysical truth. But the first basic facts of the four Gospels are the statements of Jesus respecting his own person. He applies to himself two phrases which reveal the true character of his divinity and humanity and their related position in view of his life and work; the Son of God and the Son of Man.

The term Son of Man, found about 75 times in the Gospels, has been variously interpreted. Many scholars have regarded it as an expression borrowed from the Old Testament, presumably from Daniel, and used by Christ for the purpose of proving his identity with the human race; while others of equal ability have held to the idea that it indicated his true humanity in an ideal form, as the representative type of all men and as the absolutely perfect and sinless one for the world's study and imitation.

In closest connection with the preceding facts, Jesus is called the Son of God, in a sense that admittedly implies a peculiar position and power in the kingdom of heaven. The term is undoubtedly also taken from the Old Testament, and has a continual messianic significance throughout the whole of the apostolic writings. But in the narrative of the four Gospels and in the affirmative doctrines of the Pauline epistles, where frequent explanatory and synonymous phrases are used, the aim of the inspired writers seems to have been to give Christ a distinction of Person which would attach to him essential Deity. In every instance, they contended that he was, by nature, God's Son—"The Only Begot-

ten Son"—from all eternity, and that by virtue of his divine authority he became the revealer of the Father, the Godhead, and the teacher and exemplifier of the doctrine of the brotherhood of man. In proof of these declarations, they cited the exclusive claims which he made, of a heavenly origin; declaring himself the founder of an eternal kingdom of love, with a knowledge of men's sins and with the power to forgive them; and presenting, in his miraculous efforts, a potential individual self-consciousness dependent upon itself alone for being and capable anon of living in defiance of death and beyond the grave. With this sublime, unparalleled, and self-sustaining heritage of truth conferred upon his co-workers, he, the Divine Nazarene, vanished, for awhile, from earth, to sit upon his Intercessorial Throne, until he shall come again, in final triumph over the powers of evil.

II. HISTORICAL CHRISTOLOGY.

And while such most briefly stated is the Biblical doctrine of the person of Christ, the facts of its *Historical Development*, have become matters of the greatest importance to the Christian Church, because of their philosophic value in demonstrating the wonderful drama of redemption; because of the vital elements of faith, love, devotion, and sacrifice, in the progress of true Christianity, and because of the radical indifferentism of the age with its reinforcements of humanitarian and materialistic tendencies.

The consecutive ecclesiastical epochs of a complete Christology very naturally extend themselves from the first century of the Christian Era to the Council of Nice, 325 A.D., and from that date to the Chalcedonian Statement of 451 A.D., including the subsequent ecumenical controversies and decisions, up to the time of the adoption of the Protestant Confessions of Faith, such as the Lutheran, Anglican, and Calvinistic. During the years 1530-1700, the doctrine of Christ's Person, received the highest theological development, among the Christian bodies, and within the schools of liberal thought. After this period to the present time, Christological truth, has had numerous expositors, with every shade of opinion, ranging from Socinianism, through Unitarianism and Rationalism, to the Kenosis theory which has found some modification in the doctrine of a progressive incarnation.

The *Ante-Nicene Christology* began with variant interpretations of the confession of Peter and John's statement concerning the incarnate Logos. The first critical analysts of these sentences were the Ebionites, who held to a human Christ, and the Gnostics, who, like the Docetæ, regarded his humanity as a "mere vision" or "phantasm of a body," but magnified the supernatural elements in his appearance. Following after these, there came a triple-headed heresy under the names, Dynamic, Patripassian, and Sabellian Unitarianism, which respectively denied his divinity but admitted his supernatural generation by the Holy Spirit, and affirmed it, but made it one with the Father's essence, thus denying the independent personality of Christ.

Against these errors, the Church set the dogma of his divine-human person as embodied in the Nicene and Chalcedonian creeds, although many speculative theological opinions concerning

CHRISTOLOGY

his person, were bandied by such teachers as Justin Martyr, Clement, Origen, Irenæus, Tertullian, and others, who each, in order, considered the Logos as presentative of phases of the Godhead, under limitations, but within the radius of ideal and absolute power. Their ideas of the Son, in the most abbreviated form, were expressed by such terms as a hypostatical being, the ultimate principle of existence, the eternally generated Son, the visible of the Father, the part of the divine Substance, and the subordinate Son.

These discussions were finally reduced to two kinds of Christological truth, under the Arian heresy and the Athanasian defense. Arius took an extreme view of the person of Christ, by denying his deity, and by placing him in a subordinate position, with a different essence from God, though of pre-existent form, which, in time, became incarnated in man for the world's salvation. Semi-Arianism qualified this view by using the term *similarity of essence* against *difference* or *equality of essence*. Athanasius, the "Great Orthodox Father" and Bishop of Alexandria, vigorously combated the unorthodox position of the Arian and Semi-Arian party, throughout his whole life. He enforced the opinion that Christ, while a being inferior to God, is eternally begotten and of essential oneness with the Father. The stress of his logic was laid upon the word, *homo-ousia*,—equality of essence. His able defense was endorsed by three Cappadocian bishops—Basil, Gregory of Nazianzen and Gregory of Nyssa, whose trinitarian ideas were afterward incorporated in the Nicæno-Constantinopolitan creed of 381 A.D.

We believe . . . in one Lord Jesus Christ, the only-begotten Son of God, begotten of the Father before all worlds [God of God], Light of Light, very God of very God, begotten, not made, being of one substance with the Father; by whom all things were made; who for us men and for our salvation came down from heaven, and was incarnate by the Holy Ghost, of the Virgin Mary, and was made man.

After these reassertions of orthodoxy, there arose other heretical influences within the Church, through Appollinaris, who conceived Christ's person to be possessed of a human body and an animal soul, but without reason. In this case the Logos was united with an imperfect humanity. Nestorius, on the other hand, admitted that Christ had true deity and true humanity, but the union of the two natures was merely on a sympathetic basis. The Nestorian Christ is two persons—one divine, and one human. His scheme failed in distinguishing between nature and person. Directly opposed to him, was Eutyches, who strongly asserted the unity of the two natures, but sacrificed their individuality in the process of the incarnation wherein the human was absorbed by the divine, resulting in one person and one nature.

The Nicæno-Constantinopolitan statement of 381 failed to harmonize the different schools of Christological thought, as could be seen in the antagonistic debates of the men who sat in the Councils of Ephesus 431 and 449 A.D. And so, in the year 451, the Council of Chalcedon, at which Leo. I. of Rome exercised such a potent influence, made an attempt to define in clear and exact terms, the doctrine of Christ's Person. But this effort only brought more discussion under the specious forms of Monophysitism and

Monothelism. The former affirmed that Christ had but one composite nature, the divine. His humanity is a mere accident of the divine life. The latter taught that he has one will and one energy and that both are divine.

After nearly a century of furious controversy over these adverse opinions, the Sixth Constantinopolitan Council formulated supplemental statements concerning Christ's natures and will, which, while defective in many essential points, brought to the Greek and Latin Churches, for a time, a settled theological condition, but furnished afterward for the rationalistic thinkers of the 17-18th centuries an immense fund of Christological material for speculation and criticism, as it will hereinafter be seen.

Chalcedonian Christology teaches that "Jesus Christ is perfect as respects godhood, and perfect as respects manhood; that he is truly God, and truly a man consisting of a rational soul and a body; that he is consubstantial with the Father as to his divinity and consubstantial with us as to his humanity, and like us in all respects, sin excepted. He was begotten of the Father, before creation, as to his deity; but in these last days he was born of Mary, the mother of God, as to his humanity. He is one Christ existing in two natures without mixture, without change, without division, without separation—the diversity of the two natures not being at all destroyed by their union in the person, but the peculiar properties of each nature being preserved, and concurring to one person and one subsistence."

It will be noticed that the leading thoughts of this declaration, are that the Person of Christ has two natures and that they are set in their true relation to each other.

1. His incarnation as expressly taught by John's doctrine of the Logos, gives him the place of the second person in the Godhead, with deity before his birth and with the same after he has assumed full humanity. The union of the two into a personality does not change their individual properties or essence. The human is not transmuted into the divine, nor the divine into the human, neither is there a compounded result or *tertium quid*, by mixing the two, but he is one person, both divine and human, a theanthropic being, the God-man.

2. The Person of Christ is distinguished from the natures that compose it. Nature as defined by Leo the Great expresses the quality of a being, while person is the distinct self-asserting and acting conscious ego of the subject. For example, Man is composed of two natures—the material and the spiritual. The material on the one side, does not constitute man, nor does the spiritual on the other, make man. But their union gives man his individuality, his self-conscious personality. In this union the material remains unchanged and so likewise the spiritual. In the Person of Christ, the Logos took up a human nature, but in the act, the divine nature did not change its essence nor its properties, nor did the slightest alteration occur in his humanity.

3. While the Council of Chalcedon emphasized the duality of natures, it also taught that the qualities of both natures may be attributed to one person, but not those of the one to the other. The two natures are complete and each one has everything essential to divinity or humanity. But the divine remains the divine and

CHRISTOLOGY

the human ever human, and yet the two are imbued with one common life and are inseparable.

4. A consequential idea came from this in relation to Christ's suffering and death. He suffered in his human nature, but not in his divine. He actually endured death on the cross, but only in his human nature, which he had assumed in order to suffer and die for man. His sacrifice was infinite because his person is infinite, although the nature through which the person suffered is finite.

5. Another important consideration may be drawn from the Chalcedonian dogma of Christ's Person. "The incarnation is the humanizing of deity and not the deification of humanity. The second subsistence in the divine essence assumes human nature to itself, so that it is the Godhood and not the manhood" which determines the process of redemption.

6. According to the Chalcedonian doctrine the work of Christ was accomplished by his person and not by either one of his natures. The divine-human person established his kingdom, wrought his miracles, and gave infallible truth of salvation, through his divine nature, while his real human nature entered into all the infirmities of mankind.

Protestant and Catholic Christology as represented in the Confessions of Faith of the Reformation, derived its inspiration and form from the combined results of the discussions over the Apostles' and Ecumenical Creeds, and the Catholic doctrines of the Trinity and of the Person of Christ. The errors and defects which had crept into the patristic symbols, through materialistic influences, theological antagonisms, and Hellenistic philosophy, were either studiously avoided or expressed in a negative manner, by the reformers, as warnings and protests against the repetition of the heresies of the early Christian Church. The confessions of the Protestant bodies, such as the Lutheran, Anglican, and Calvinistic, have each their distinctive statements, though slightly differing from each other, concerning Christ's Person, upon evangelical bases. While some of their declarations have been as confusing and speculative as those of the Church Fathers, in the Ante-Nicene period, for the most part, they have aided the understanding of modern Christian scholarship in the interpretation of the cardinal doctrines of redemption as they centre in Jesus Christ.

Of the six great Confessions of Faith, the Augsburg (1530), the First Helvetic (1536), the Heidelberg Catechism (1563), the *Canones et Decreta Concilii Tridentini* (1564), the Thirty-nine Articles (1562-77), and the Westminster (1643), the Lutheran Symbol is undoubtedly the most important of them all.

Lutheran Christology.—In the third and tenth articles of the Augsburg Confession, the Christological position of the Lutheran denomination is clearly set forth. These items, referring as they do, to the divine-human Person of Christ, in his redemptive work, and to his presence in his supper, were drawn from the Nicene and Athanasian creeds. And in order to be doubly fortified against misconstruction of the Lutheran idea, even while it was based upon those ancient symbols, the *Formula Concordiæ* (1580), including the *Apologia Confessionis*, the *Confessio Saxonica*, the *Confessio Wurtembergica*, the *Articles of Smalcald*, and

Luther's *two Catechisms*, *Major* and *Minor*, was given to the world, as a fuller and more scientific presentation of that Christological conception. But in both of the symbols, the Augsburg Confession and the Book of Concord, the doctrine of Christ's Person is defined within the metaphysical term, *Communicatio Idiomatum*, which is subdivided into four other explanatory phrases: (1) The *genus idiomaticum*, having reference to the transference of the properties of one nature to the whole person; (2) the *genus apotelesmaticum*, indicating how the functions of the whole person may be assumed by one or the other nature; (3) the *genus majesticum*, showing in what manner his humanity may be clothed upon by the attributes of his divinity; and (4) the *genus kenoticum*, implying the humiliation of the divine nature to the level of the human. Each one of these phrases implies the fact of Christ's two natures, the divine and human, their inseparable union, and their individual properties and attributes as they operate separately or conjointly in his redemptive presence and power. The third *genus*, however, carries the additional implication of an intenser sphere of personal action, by ascribing to his body, a ubiquitous presence under special or general circumstances, and in the Eucharist. Here the Lutheran Church is not far removed from the Roman Catholic view of Christ's presence in the celebration of the mass—*transubstantiation*—though the dogmatic basis of that very materialistic conception of his body and blood, was modified by it, with the casuistic word *Consubstantiation*, which teaches the *realis presentia* of Christ, in the sacramental elements, "in, with, and under" the bread and wine.

But Lutheran Christological thought reached wider dimensions than mere definitions of Christ's two natures and their union into one person. Its creedal triumph embraced also the doctrine of his two states—his humiliation and his exaltation. The first of these referred solely to his human nature within the circle of his earthly experiences, to the time of his death and burial, while the second included the assumption, by his human nature, of the divine glory after his redemptory work was completed.

Anglican Christology.—The Christology of the Established Church of England and of the Protestant Episcopal Body of America, as outlined in the Thirty-nine Articles, had its original ideas taken from the Chalcedonian Creeds, although the formularies of these churches, had a successive growth from radical and changeable theological conceptions to the present fixed standards of belief found in the 'Book of Common Prayer.' This is clearly indicated in the fact, that the doctrine of Christ's Person, as shown in the first Ten Articles (1536), was a spasmodic attempt to combine the Lutheran and Roman Catholic tenets. After the result of this combination was obtained, the defenders of the faith discovered that their dogma of the Real Presence was as Romanizing in its meaning as the Catholic statement of transubstantiation. This produced much dissatisfaction, especially so, in the South, where Protestantism had many strong supporters. In consequence, this creed soon fell into disuse, and with its practical discontinuance, a conference between Henry VIII. and a Lutheran embassy was called at which a new statement of Articles was drawn up, incorporating Cranmer's 'Thirteen Latin Articles.

CHRISTOLOGY

of Faith.' In these there was a close adherence to the Lutheran doctrine of the two natures of Christ and their unified life in one person, though afterward, at a disputation, held in London, in 1548, the Lutheran idea was repudiated by declarations of sympathy with the reformed doctrine, while at the same time, the ubiquity of Christ's body also received an absolute denial. After the revision of the Forty-nine Articles of Religion, adopted in 1552, during the early reign of the erratic Elizabeth, who was a Lutheran at heart, final statements were made, in the second and twenty-eighth of the Thirty-nine Articles and authorized by the Uniformity Act of 1662, concerning Christ's Person, which were strictly Calvinistic. As such they stand in the creedal structure of the present Anglican and Protestant Episcopal churches, and read as follows:

The Logos, which is the Word of the Father, begotten from everlasting of the Father, the very and eternal God, and of one substance with the Father, took man's nature in the womb of the blessed Virgin, of her substance: so that two whole and perfect natures, that is to say, the Godhead and Manhood, were joined together in one Person, never to be divided, whereof is one Christ, very God and very Man; who truly suffered, was crucified, dead, and buried, to reconcile his Father to us, and to be a sacrifice, not only for original guilt, but also for actual sins of men.

The Supper of the Lord . . . is a Sacrament of our redemption by Christ's death; insomuch that to such as rightly, worthily, and with faith, receive the same, the Bread which we break is a partaking of the Body of Christ; and likewise the Cup of Blessing is a partaking of the Blood of Christ.

Transubstantiation (or the change of the substance of Bread and Wine) in the Supper of the Lord, cannot be proved by Holy Writ, but is repugnant to the plain words of Scripture, overthroweth the nature of a Sacrament, and hath given occasion to many superstitions.

The Body of Christ is given, taken, and eaten, in the Supper, only after an heavenly and spiritual manner. And the means whereby the Body of Christ is received and eaten in the Supper is Faith.

Calvinistic Christology.—While the Anglican churches have adhered to a strict form of Calvinism in their Christological teachings, the numerous Confessions of the Reformed Church have assumed a more ultra-theological position in their interpretation of the Chalcedonian Symbols. They did not overlook Christ's essential deity, but they placed greater emphasis upon the dignity of his human nature. In this respect the Calvinistic reformers exerted a powerful influence upon the development of the doctrine of the Person of Christ from the anthropotheistic side. How apparent this has been, can be seen in some of the formidable confessional documents handed down by the Protestant churches.

The Confessio Tetropolitana (1530), Zwingli's Fidei Ratio (1523), The Second Helvetic Confession (1566), the Palatinate Catechism (1563), The Belgic Confession (1561), The Canons of the Synod of Dort (1619), and The Westminster Confession of Faith (1647).

In each one of these, and particularly so, in the great Westminster Confession, one or more articles expressly assert the doctrine of the full integrity of Christ's divine and human natures and their properties. The question of the interchange or communication of their qualities, is not so much the point at issue, as the absolute independence of each nature in their mediate union without "conversion, composition, or confusion." But the union of the two natures, according to the Article VII., 'De Christo Mediatore,' in the sixth part, is hypostatic or personal

—an affinity of the Logos — personality with the human. The paragraph declares that:

The Son of God, the second person in the Trinity, being very and eternal God, of one substance, and equal with the Father, did, when the fullness of time was come, take upon him man's nature, with all the essential properties and common infirmities thereof, yet without sin — being conceived by the power of the Holy Ghost in the womb of the Virgin Mary, of her substance. So that two whole, perfect, and distinct natures, the Godhead and the Manhood, were inseparably joined together in one person, without conversion, composition, or confusion. Which person is very God and very man, yet one Christ, the only mediator between God and man.

This section, when taken with five others under the same title, clearly affirms three phases of the hypostatic union of Christ's two natures: (1) the communion of natures; (2) the offices of prophet, priest, and king; (3) the state of humiliation and exaltation.

1. The communion of natures is manifested in three distinct ways: (1) By the transference of the properties of each nature to Christ's person; (2) by the concurrent operations of the two natures in his mediatorial work; (3) by the contributions of the Logos toward the human nature, of honor, knowledge, and power, and especially of sinlessness, without interrupting the growth of his humanity in his earthly efforts to save man. In the first and second conclusions, the Calvinistic teachers agree with the Lutheran theologians. But they do not hold to the theory that the properties of one nature may be given to another, nor do they teach that the attributes of the divine nature can be transferred to the human, because the human nature is finite and incapable of the divine; neither can the attributes of the human be communicated to the divine, because the divine nature is not subject to changes, nor capable of imperfections. With these logical deductions, the rejection of the ubiquity of the body of Christ, naturally had to follow. For the reformers believed that Christ's humanity was necessarily limited and hence it could not possibly assume omnipresence.

2. The offices of prophet, priest, and king. (a) In nine *special* instances Jesus is called a prophet. But he has that designation throughout all the Scriptures. Moses spoke of him as such, and beyond all doubt the God — Jahveh — of the Old Testament, was the God-man of the new dispensation of salvation. As a prophet he had a particular office to fulfill; to disclose the will of Jahveh; to reveal his love in his covenants with his people; and to outline the plan of salvation in his life-work through his miracles, death, resurrection, and his second coming.

(b) As a priest Jesus sustained to the redemption of mankind the singular position of a superior and consecrated subject of God, for the express purpose of becoming the once-for-all sacrifice for sin and the eternal intercessorial representative of man before the throne of heaven.

(c) As a king of a kingdom whose end can never be, Jesus exercised his sway within men's hearts. There he is to reign. There his triumphs are to occur. And there he is to hold dominion forever as the Lord of Lords, and the Crowned King of Kings.

3. The state of humiliation and exaltation.—The former embraces every step of the Person of Christ, wherein his divine nature emptied itself temporarily of glory, for the accomplish-

CHRISTOLOGY

ment of his redemptory work on earth among men. It includes his birth, his self-denying life, his death, and descent into Hades. The latter explains his relinquishment of human qualities for his glorification. It comprises his resurrection, his ascension, his intercessory office, and his final second appearance. Upon these two states, the Lutheran and Reformed Christologies practically agree, except on the minor points of Christ's specialized humiliation and his descent into Hades. Calvinism holds that not only was Christ's divine nature humiliated, but his human also, whereas Lutheran Christology ascribes the two states only to his human nature. Calvinistic thought makes Christ's descent into Hades the end of his humiliation, while Lutheran faith regards that as the beginning of his exaltation.

Catholic Christology.—The transcendent importance and consistency of Roman Catholic Christology has always been vested in a recognition of the Nicæno-Constantinopolitan Symbols, and in a subscription to the Seven Sacraments of the Church, since their official sanction by the Council of Florence in 1439. It is through them that salvation is obtained. How the benefits of Christ's passion in particular are applied to men is explained in the doctrine of his Supper, by the term transubstantiation. Here is the central approach to the inner love and life of Jesus Christ. For in this Sacrament of the Altar, Jesus gives his body to the souls of men, and this act imparts to them, continually, new, divine, and everlasting life, the climactic result of salvation.

The doctrine is outlined in the following words, under questions and answers, from Goffine's 'Manual':

What is the Holy Sacrament of the Altar?

It is that sacrament in which, after the words of its institution have been spoken by the priest, Jesus Christ is present whole and entire, in his Godhead and in his Manhood, under the appearance of bread and wine.

What takes place at the words of consecration?

The Bread and Wine are changed into the Body and Blood of Jesus Christ.

How is Jesus present in the Most Holy Sacrament?

He is truly, really, and substantially present, in his Divinity and Humanity, in flesh and blood, in body and soul.

Modern Christology.—The reactionary period in Christological thought was bound to come in modern times, as was often the case in the early ages of the progress of the Church. The leaders of liberalistic movements were not satisfied with the conservatism of Protestant and Catholic theology, in its exegesis of the doctrine of Christ's Person. The metaphysical aspect of his life and work needed a reconstruction. To this end two classes of Christologists have appeared in these days of radical biblical criticism: The Rationalistic School and the Mystics. To the first belong the Socinian, Unitarian, and extreme Rationalistic Christologies, and to the second, the Swedenborgian, the Kenotic Theory, and the Gradual Incarnation Idea.

Socinian Christology.—Socinianism has its fundamental basis in a denial of the Trinity, and in a belief that Christ was merely a man. According to the Racovian Catechism of Schmalz, published in 1605, Jesus Christ had no pre-existence previous to his conception. Nevertheless after his birth he became divine and the Son of God, because of his sinless life, and character, his miracles, his resurrection and ascension.

Unitarian Christology.—This form of Christological thinking came as a logical sequence to Socinian influence. It rejects the doctrine of the Trinity and the divinity of Christ. He is the highest revelation of God and the ideal of humanity.

Extreme Rationalistic Christology.—This school of Christology had some of the most brilliant intellects of the world, among whom were such men as Kant, Hegel, Schelling, Schleiermacher, Rothe, Strauss, and Keim. Every one of these, with perhaps one possible exception, swung away from the orthodox conception of Christ's Person, to a philosophy of Idealistic Pantheism, which combined in its teachings the effort, on the one hand, to place Christ upon a humanistic plain, and the desire on the other to give him the pre-eminence over men within the circle of ideal humanity. Foremost among these was Kant, who believed that Jesus was the Son of God, but as such the ideal of the perfect man. Both Hegel and Schelling looked favorably upon the doctrines of the Trinity and the Person of Christ, but they applied to them the leveling process of materialistic pantheism, thus making Christ a man who is simply conscious of his being with the Absolute, but a representative of what every other man is who belongs to the human race. Strauss practically held to this view in his 'Life of Jesus' (1864). In that book he modified his opinions of the miraculous element in the New Testament, but still held to the idea that Christ was divine so far as he entered into humanity as a collective body. Withal, for Strauss, "he remained the highest model of religion within the reach of thought, and no perfect piety is possible without his presence in the heart." Keim bore stronger testimony to this phase of Christ by declaring that his person is the greatest work of God—a specific revelation of God: God's image, his best beloved object in the universe, his noblest ideal. Rothe, who was largely influenced by Schleiermacher's philosophy, developed his idea of Christ by setting him forth as the self-realization of God. The first step in this realization became apparent in the incarnation when Christ found an ethical union between God and man. But this ethical union could only become an ethical fact through the divinity of Christ. And while he was born of a woman, his ethical advance was real, because God dwelled in him. The great work to which he set himself, after he realized his fellowship with God, was to offer his all to God and to men in his sacrifice and death. Herein was the culmination of his vicarious service,—perfect union to God and union to men. His love could go no farther than this in saving the world. Schleiermacher, who was Rothe's master, and the master philosophic theologian since Calvin's time, started with the humanity of Christ, which he regarded as passive. But beyond this, he found a supernatural element in the person he loved, the moral miracle of God. Christ has perfection and sinlessness, with God ever dwelling in him. Through this enduring affinity with God, he accomplishes his atoning work among men, by creating in them the desire to take upon themselves his holy and blessed life.

Swedenborgian Christology.—In direct opposition to the Rationalistic theories, there came the fanciful and mystical theology of Swedenborg who claimed special illumination as to the

whole universe, and its Creator. Throughout his treatises he declares that God is one person, and that the one person is Jesus Christ. In him is the Trinity. That Trinity is the essential divinity—the Father; the Divine Humanity, the Son; and the Divine Operation, the Holy Spirit, one true God, Creator and Redeemer.

The Kenotic Theory.—After all the different theories concerning Christ's Person had been thoroughly reviewed by both liberal and conservative scholarship—some to be accepted and others to be rejected—modern Christological efforts, as supported by the exponents of a scientific theology, have been directed to a solution of the mystery of his person in connection with his active work on earth, by reducing the whole matter to what is known as *The Kenotic Theory*. This term derives its significance from a famous passage in Philippians, chapter ii. 7, where the Greek expression is used—*ἀλλ' ἑαυτὸν ἐκένωσε*, which literally translated means—“But he emptied or divested himself of prerogatives or functions.” The three parties who held to the different interpretations of this phrase, substantially agreed as to the essential fact involved in Christ's self-exiniation or self-evacuation. But they respectively asserted that while his human nature had full possession of divine attributes, from the time of his incarnation, they could not agree upon the common ground of the use to which he put them. Hence three theories were suggested, as to the use of his divine nature during his humiliation. First, he simply concealed his divine functions during his active life among men. This idea was taught by the Tübingen divines in the 17th century against that of the Giessen theologians whose leader was Chemnitz. Second, Christ in becoming incarnate, reduced himself to humanity by the *non-use* or by the *abandonment* of his divine attributes, in the state of his humiliation. Third, he had only a divine ideal existence before the incarnation, and at that time, the Logos did not assume flesh, but actually *became* flesh, with human limitations. This, therefore, implied a growth of the divine in the human form and a gradual unfolding of the idea of the divine consciousness, a metaphysical evolution of the Godhood of Christ.

The Gradual Incarnation Idea.—The last view brings out another phase of modern Christological speculation—the theory that the Logos became flesh by a gradual descent of the divine consciousness to his humanity, and by an ascent of the human consciousness to his divine nature. Christ, according to Luke i. 80 and ii. 52, developed into a divine being through periods of human experience, although his supernatural origin was an undeniable fact, but the capabilities of his Person were limited to the expansive power of his divine life.

III. THE ETHICO-PRACTICAL CHRISTOLOGY.

There now remains for the Christian Church the task of reconstructing, or rather of re-emphasizing the doctrine of Christ's Person in his real personal intercourse with men, in the expression of his passion and power, and in the mighty influences of his truth. The natural features of his Person have been exploited, such as his humanity and divinity and their unified operative qualities, in their active

and passive relations to God, the Father, and the Cosmical Universe. But the essential *forces* which eternally spring from him, need a new setting in a *Science of Christology* whose domain shall be an accurate investigation of *facts* in their historic order and bearing and the unfolding of the *ethical* principles involved in them. This, therefore, must include the two possible fields for intellectual effort which have recently been opened: *Sociology* and *Christ's Own Ethics*. The former can never be a distinct science without a recognition of Jesus Christ as *the only true Exemplifier* of the Social Idea; and the latter is unquestionably the final affirmation of God to man, and Christ, in turn, the last full explanation of his redemptive motive, love, and plan, through which the world may be saved!

In what order these sciences shall eventually be combined with the historical Christological thought of Christendom, is perhaps an unknown matter at this time. But this one thing is *known* that He Who was the Jehovah of the Old Testament and the God-man of the New Testament, is now the answer to every problem of the human race!

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Presbyterian Clergyman.

Christophe, Henri, òn-rē krēs-tōf, king of Haiti: b. Grenada, West Indies, 1767; d. 8 Oct. 1820. He was an African slave who received his freedom, as a reward of faithful service. On the outbreak of the negro insurrection in St. Domingo, 1801, he became one of its leaders, and

attracted by his energy and ability the attention of Toussaint l'Ouverture, who conferred upon him a divisional military command. After the deposition of Toussaint, Christophe served under his successor, Dessalines, and waged a war of increasing ferocity against the French, who, in 1803, were compelled to evacuate the island. In 1811 Christophe obtained undisputed possession of a portion of the island, and had himself proclaimed as Henri I., king of Haiti. His reign was that of a sanguinary despot, occasioning ultimately a successful revolt of his black subjects, whereupon he committed suicide.

Chris'topher, Saint, a saint whose name and feast are celebrated, but whose history is little known. He is reported to have been a native of Syria or Cilicia, who was baptized by Saint Babylas, bishop of Antioch, and received the crown of martyrdom in Asia Minor about the middle of the 3d century. Relics of him are found in several places, principally in Spain. The Eastern Church celebrates his festival on 9 May; the Western on 25 July. His intercession was particularly sought in the time of the plague. Christopher literally means "bearer of Christ." He is represented as a giant, bearing the child Jesus upon his shoulders over a stream, which refers to a legend of this saint.

Christopher North, pseudonym of John Wilson, the Scotch author (q.v.).

Christopher's, St. (commonly called St. Kitt's), West Indies, an island of the Lesser Antilles, 100 miles northwest of Guadeloupe, discovered by Columbus in 1493, 23 miles in length, averaging about five miles in breadth, and having an area of 65 square miles. It produces sugar, potatoes, tomatoes, yams, onions, and other vegetables, as well as pineapples, bananas, custard-apples, cocoanuts, and various other fruits. Mount Misery, the highest elevation, rises 4,100 feet. The flora and fauna are similar to those of the West Indies generally, among the latter being a species of small monkey. The climate is considered to be very healthy. This island is divided into nine parishes, Basseterre being the capital. It was colonized by the English in 1623. Pop. 31,000.

Christop'ulos, Athana'sios, Greek lyric poet: b. Kastoria, Macedonia, 1772; d. Wallachia 29 Jan. 1847. He studied medicine, and the sciences at Budapest, and finally settled at Hermannstadt in Transylvania. An epicurean in every sense of the word, and unconcerned for the fate of his country, he lived only for the gratification of his appetites and celebrated sensual indulgences in his 'Erotika and Bacchika,' or 'Love and Drinking Songs,' which have been several times collected and printed under the title of 'Lyrika.' Though partly modeled upon Anacreon and the songs of Piron, Desaugiers, and other French authors, they display so much ease and simplicity, tenderness and grace, as to give their author a high place among the poets of his nation, and entitle him to the name of the modern Anacreon.

Christ's Hospital (generally called the Blue-coat School, from the costume of the pupils), a school in London, founded by Edward VI., for supporting poor orphans. There used to be from 1,000 to 1,200 boys and girls at this establishment receiving instruction, board and clothing, the girls being comparatively few

in number. The ages varied from 8 or 10 to 15 or 16, five of the best scholars being sent each year to Oxford and Cambridge. An entirely new scheme of management came into operation in 1891, according to which the preparatory school (established in 1683 at Hertford) has 120 pupils, the boarding-school for boys 700, and the girls' school 350; a day-school for 600 boys, and another for 400 girls, being also provided for. New hospital buildings are being erected at Horsham. Entrance to the Hospital Schools is partly by nomination or presentation, partly by competition; and in regard to two thirds of the scholars, fees ranging from £10 to £20 may be charged if the parents or relatives are judged to be able to contribute to the child's education and maintenance. Numerous exhibitions and prizes still remain, including exhibitions to the universities. The great hall at Christ's Hospital is a splendid room of great size, and remarkable for some very fine pictures. Camden, Stillingfleet, Coleridge, Charles Lamb, and other distinguished men received their education at Christ's Hospital.

Christ's Thorn, a small thorny shrub of the order *Rhamnaceæ*, or buckthorn family. It is common in the southeast of Europe and Asia Minor, especially in Palestine. The fruit has a singular appearance, resembling a head with a broad-rimmed hat. The spines are long and sharp, growing on slender vine-like branches which are easily plaited, the flowers rose-shaped. The plant derives its name from its being believed by many to be the plant from which the crown of thorns was made which was placed on the head of our Saviour. The fruit is called jujube.

Christy, kris'ti, Charles, American minstrel: b. New York 1828; d. Kansas City, Mo., 13 Feb. 1897. He was an actor from boyhood, supporting Forrest and Macready as well as singing on the minstrel stage.

Christy, Howard Chandler, American illustrator: b. Morgan County, Ohio, 10 Jan. 1873. He was educated in the public schools of Duncan's Falls, Ohio; went to New York in 1893 and since then has been continuously engaged in illustrating for the leading periodicals, 'Scribner's Magazine,' and 'Harper's Magazine' especially.

Chrodegang, or Godegrand, SAINT, bishop of Metz: b. about 700; d. Metz 6 March 766. He was a native of Hosbania (Belgian Limburg), and was a descendant of a distinguished family among the Repuarian Franks. Pepin the Short, in 742, appointed him bishop of Metz; in 753 he conducted the Pope on a journey from Rome to Gaul; and in 764 brought from Rome the relics presented by the Pope to the churches and monasteries of Gaul. He was the author of the rule 'Vita Canonica.'

Chro'mates. See CHROMIUM.

Chromat'ic, in music, a succession of semitones, ascending or descending. The chromatic semitone is the interval between any given note and that same note raised by a sharp or lowered by a flat. The chromatic scale consists of 13 tones, the 8 scale tones and the 5 intermediate. It is believed by some that the term chromatic was adopted because the Greeks were in the habit of designating the intermediate tones by characters of various colors.

CHROMATIN — CHROMIUM

Chromatin, krō'ma-tin, a substance in the nucleus of a cell which is readily stained by certain reagents, such as carmine, hæmatoxylin, and suffranin, so as to be distinguished from the other substance called achromatin or linin. This chromatin is made up of minute spherical or rod-like particles called "chromosomes." The latter bodies in the course of cell-division are of equal size in the same cell, and their number is the same in all the cells of all the tissues of the same species. The chromatin particles are of especial interest because they are supposed to be the bearers of heredity, and are thus supposed to form the physical basis of this unknown property of organic life. See HEREDITY.

Chromatophore, krō'ma-tō-fōr, a pigment cell. The possibility of change of color in the chameleon, frogs, the squid, etc., is due to certain cells in the cutis which are filled with pigment. These pigment-cells are called chromatophores, and under the stimulus of light may expand or contract. When expanded they are highly ramified, and when contracted are roundish. The pigment differs in different individuals and in different parts of the body, being yellow, brown, black, and at times even red or green. In the goby (a fish), the chromatophores, which are yellow or greenish-yellow when distended, become orange when contracted; while the orange or red ones, when shrunk, become brown or even black. In the same fish a still different kind of chromatophores are filled with iridescent crystals of marvelous delicacy, which in expansion become visible as spots of metallic sheen. It is on the distribution and different depth in the skin of the chromatophores that the pattern of markings of the skin of changeable animals depend. The common squid is very beautifully tinted, and under the microscope the chromatophores can be seen dilating and contracting, giving off a remarkable play of all the colors of the rainbow. The value of this power, which is under control, is that it gives the animal means of concealment by adapting its color to that of its surroundings.

Chromatope, krō'ma-trōp, or **Chromotrope**, -mō-, a toy consisting of a disk painted with arcs of circles in brilliant colors in such a manner that when the disk is revolved centrifugal or centripetal streams of color seem to flow through it. The term is also applied to an attachment for a magic lantern, by which, on the revolution of two painted disks of glass, kaleidoscopic effects are projected onto the screen.

Chro'matype, a photographic picture in which the paper employed has been sensitized by some of the salts of chromium.

Chrome Green, the green oxide or sesquioxide of chromium, forming a green pigment used by enamelers. It is also employed by dyers and calico-printers as a mordant. A hydrated variety, $\text{Cr}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$, used for the same purposes, is known as "Guignet's green" or "emerald green." "Arnaudon's green" contains some phosphoric acid in addition. These are now used instead of the poisonous greens prepared from arsenic as a base. See CHROMIUM.

Chrome Iron Ore. See CHROMITE.

Chromic Acid. See CHROMIUM.

Chromite, or **Chromic Iron**, the only important ore of the metal chromium and the source of all of the chromium salts. Chemically considered, it is a chromate of ferrous iron FeCr_2O_4 , but it is usually classified by mineralogists among the oxides of the spinel group as a compound of iron protoxide, with chromium sesquioxide, having the formula $\text{FeO} \cdot \text{Cr}_2\text{O}_3$. The metals are often in part replaced by magnesium, aluminum, and ferric iron, as in the variety magnochromite from Silesia and mitchellite from Webster, N. C. The composition of the mineral thus approaches the chromiferous variety of spinel, picotite. Chromite has a hardness of 5.5 and a specific gravity of 4.32 to 4.57. It is usually a granular-massive, black, opaque, metallic mineral, much resembling magnetite. It has, however, a dark-brown streak and is readily distinguished from all black minerals by fusing it with borax and salt of phosphorus, the bead thus obtained assuming an emerald-green color on cooling. It is further identified by its invariable occurrence in serpentine or olivine rocks. It is often disseminated in grains, or rarely in small octahedral crystals, and thus upon the disintegration of the rock the grains are washed into the streams and adjoining bottom-lands. Prior to 1884 it was extensively mined near Baltimore, also at Texas, Pa., and in California, but the domestic production in 1902 fell to \$4,567, while ore to the value of \$582,597 was imported into the United States in 1902, chiefly from Asia Minor. The large deposits in Quebec, Yancey County, N. C., and in many other localities will no doubt be important sources of supply in the future.

Chromium, krō'mī-ŭm (Gr. χρώμα, "color," in allusion to the colors exhibited by its compounds), a metallic element discovered in 1797 by Vauquelin, in the native chromate of lead of Siberia, and afterward found combined with iron. The metal itself has never been prepared in large quantities, but it can be obtained by the reduction of the oxide by carbon in the electric furnace. It is also obtained by heating the anhydrous sesquichloride of chromium with zinc, potassium, or sodium. Chromium is extremely hard, of a grayish-white color, and less fusible than platinum. Its chemical symbol is Cr, and its atomic weight is 52.1 if $\text{O} = 16$, and 51.7 if $\text{H} = 1$. Its specific gravity is from 6.5 to 6.8, and its specific heat is about 0.1, though the latter constant has not been determined with precision. Once separated from oxygen, it does not readily combine with it again. It oxidizes superficially, however, upon being heated in air, and it decomposes steam at a red heat.

Chromium forms four different oxides, whose formulæ are respectively CrO (chromium monoxide); Cr_2O_3 (chromium sesquioxide); $\text{CrO} \cdot \text{Cr}_2\text{O}_3$ (chromo-chromic oxide); and CrO_3 (chromium trioxide). Of these the first two act as bases, each yielding a series of salts with various acids. Those salts that are derived from the monoxide, CrO, are called "chromous" compounds; while those that are derived from the sesquioxide, Cr_2O_3 , are called "chromic" compounds. Chromium sulphate, $\text{Cr}_2(\text{SO}_4)_3$, forms a series of alums with the sulphates of potassium and ammonium, the element behaving in this respect like aluminum. (See ALUM.) Chromo-chromic oxide is not chemically active. Chromium trioxide, CrO_3 , dissolves in water with the formation of an acid, H_2CrO_4 , which is called

CHROMIUM — CHROMOSPHERE

“chromic acid,” and is of great interest to the chemist. Chromic acid forms a series of definite salts that are known as “chromates.” One of the best known of these is chromate of lead, PbCrO_4 , which is used as a pigment under the name of “chrome yellow,” and is formed by precipitating chromate of potassium by a soluble salt of lead. Potassium bichromate, $\text{K}_2\text{Cr}_2\text{O}_7$, or $\text{K}_2\text{CrO}_4\text{CrO}_3$, is another extremely important salt of chromic acid; it is used as a depolarizer in electric batteries, as a bleaching and oxidizing agent, and as a convenient starting-point in the manufacture of many of the chromium compounds. It possesses the peculiar property of rendering gelatine insoluble upon exposure to light, and for this reason it is used in various photographic processes.

Chromium is used to some extent in the manufacture of steel, as it is found that the addition of less than 1 per cent of chromium materially increases the strength, hardness, and elasticity of the product.

In medicine chromic acid and potassium bichromate are used. The acid is employed as a caustic; the bichromate is now rarely employed because of its irritant properties.

Poisoning by chromium compounds is similar to that caused by other metallic poisons. The drinking of battery fluid is the usual mode. There is severe gastro-enteritis, nausea, vomiting of yellowish bloody matter, diarrhoea, pain, colic, tenesmus, great prostration, muscular cramps, rapid and feeble pulse, bloody urine (perhaps suppression of this secretion), feeble and irregular breathing, with coma or convulsions preceding death. A fatal ending may occur in from 4 to 15 hours. At times this result may be delayed, and symptoms referable to degenerative processes in the liver and kidneys appear. Treatment is by prompt and continued washing of the stomach. Bismuth subnitrate is indicated in the after treatment, which is symptomatic.

Chromium, or Chrome Steel. See CHROMIUM.

Chromo-lithography, a method of producing a colored or tinted lithographic picture, by using various stones having different portions of the picture drawn upon them with inks of various colors and so arranged as to blend into a complete picture. Sometimes as many as 20 different colors are employed. It was invented by Alois Senefelder, of Prague, between 1796 and 1800. An outline drawing is first traced, and then transferred to the various stones, one for each color. The artist puts in the colors, with soap, of the tints required. Next the slab is put upon a press and carefully damped with a sponge, after which the oil color is applied with a leather roller. The parts of the slab which contain no drawing, being wet, resist the ink, while the drawing itself, being oily, repels the water while retaining the color. In printing, the lighter shades are printed off first and the darkest last. See LITHOGRAPHY.

Chromotype See CHROMATYPE.

Chro'mosphere, the gaseous envelope which exists round the body of the sun, through which the light of the photosphere, an inner envelope of incandescent matter, passes. During total eclipses it is observed that a red-colored envelope surrounds the sun, and shoots up to

great distances from the surface. It seems to have been first recognized by Secchi; and the projecting portions of it are commonly described as “red-colored protuberances” and “red flames.” To this red envelope the name “chromosphere” was given by Lockyer. The light from it is much fainter than that from the photosphere; and till 1868, when M. Janssen and Mr. Lockyer almost simultaneously pointed out a method of viewing it, it was never seen except during eclipses. See SUN.

The spectrum of the chromosphere was first observed in 1868 during the Indian total eclipse, and it was found to consist of a number of bright lines, and conspicuous among them those of hydrogen. The light of the chromosphere was thus proved to be due to vast flames or masses of incandescent vapor or gas, hydrogen forming a large part of the whole.

Since the invention of the Janssen-Lockyer method of observing, as it is called, very remarkable advances have been made in our knowledge of solar physics, discoveries quite unthought-of having followed. The observations are made by means of a combined telescope and spectroscope. A spectroscope is substituted for the eye-piece of the telescope, the slit of the spectroscope being placed at the principal focus of the object-glass of the telescope. The slit is capable of being moved in such a way that any particular band of the image formed by the object-glass of the telescope may be examined by the spectroscope. The spectroscope employed for the purpose of examining the chromosphere must have the greatest possible dispersive power, and requires for this purpose a very long train of prisms.

As was mentioned above, the spectrum of the chromosphere consists of a series of bright lines. The breadth of a bright line of the spectrum is not sensibly increased by increasing the dispersive power of the spectroscope, but the contrary is the case with a continuous spectrum, which is extended by dispersion. Thus the latter becomes weakened, while the former maintain their brightness and become more visible in comparison with the others. The slit of the spectroscope being arranged so as to take in a band, either tangential or radial, close to the edge of the image of the sun formed by the object-glass of the telescope, it is found that the bright lines of the chromosphere are perfectly visible, in spite of the light of the continuous spectrum proceeding from the inner portion of the disk. Further, it has been found possible, by using a spectroscope of the very highest dispersive power, and by opening the slit sufficiently wide, to see the whole of one of the protuberances at once, and by this means to watch its motions and its changes. To understand this the reader must consult the article SPECTROSCOPE. He must recollect that a continuous spectrum consists of an enormous number of images of the slit, placed side by side, and in ordinary cases slightly overlapping each other. If we could employ an infinitely narrow slit we should have an infinite number of infinitely narrow images, and no overlapping whatever. But suppose a light to consist of only two or three colors, say light from a source capable only of giving the two bright lines C and F, that is, one in the red and another in the blue part of the spectrum. It is

CHRONIC — CHRONICLE

easy, even with a slit of sensible width, to keep the two from overlapping, and we shall see without any confusion the two bright lines or bands at different parts of the spectrum, darkness intervening. Now imagine a flame or tongue of fire starting up from the sun's surface, and let the spectroscope be directed on its image in the telescope; there will be only portions of the slit illuminated by it, portions corresponding to the shape of the flame, and if the flame contain only light of the bright line C and F, there will be seen two images of the flame at the points of the spectrum belonging to these colors. The observations of these flames by Mr. Lockyer has furnished us with what may be considered at present as a very complete knowledge of the atmosphere of the sun, though doubtless there is yet much to be discovered by the daily observation of them that is now carried on; and the same method applied to the sun's spots has proved not less fruitful. We can give only a few of the results here, but the reader will find an account full of interest in Mr. Lockyer's papers communicated to the Royal Society, and printed in abstracts in the Royal Society's 'Proceedings' for 1869 and 1870. He will also find in the 'Proceedings' for the same date an account of the experiments of Frankland and Lockyer on gaseous spectra, undertaken with the view of determining some questions of great importance relating to phenomena observed in the course of the researches under consideration. Latterly, by methods specially devised, excellent photographs of the protuberances or flames have been obtained.

The chromosphere and its prominences, when examined with the telespectroscope (as the instrument just described is called) exhibits, as we have said, a spectrum of bright lines, due to incandescent gases. The most elevated portions consist entirely, or almost entirely, of hydrogen, the lightest of the gases. Lower down are found the gases or vapors of the heavier metals,—of sodium, magnesium, barium, iron, and others. The lower the layer of the chromosphere examined, the more dense is the spectrum filled with lines of metals, and in the prominences the red hydrogen flames tower high above all.

From minute displacements of well-known lines in the spectrum (see SPECTRUM ANALYSIS) motions are inferred of the incandescent bodies from which these lines are proceeding. On this principle motions of the fixed stars have been determined. Thus Sirius is approaching us at the rate of 10 miles per second, and Arcturus is approaching us at the rate of 5 miles per second. The principle applied to the results of the spectroscopic examination of the prominences of the chromosphere shows that they are due to enormous outbursts of gases and vapors from the sun. These gases are projected outward with extraordinary velocity, and in their neighborhood vast cyclones are observable. It is also proved by applying the same principle that the spots on the sun's surface are due to, or at least are accompanied by, vast up-rushes and down-rushes of gaseous matter.

Chron'ic (Gr. *Χρόνος*, "time"), a term applied to diseases which are of long duration,

and mostly without fever. It is used in opposition to the term "acute," which is applied both to a pungent pain and to a disease which is attended with violent symptoms, terminates in a few days, and is attended with danger. On the other hand, a "chronic" disease is slow in its progress and not so generally dangerous.

Chron'icle, a history recounting in order of time all details which observation or tradition has furnished the author. It may be a universal history, or may deal with a single epoch, nation, city, or individual. Some chronicles have been preserved from early ages; the Old Testament Chronicles (q.v.) are a type of such. An important ancient chronicle, discovered on the island of Paros in 1627, and known as the 'Chronicle of Paros,' is an outline of Greek history, originally covering the period from the reign of the legendary Cecrops, king of Athens (1582 B.C.) to 264 B.C. The last part, from 355 B.C., is now lost. It omits many important political and military events, and deals more fully with the art and festivities of the people. In the early Christian ages, ecclesiastics were generally the authors of the chronicles; for example, Eusebius, bishop of Cæsarea, collected from other historical works his 'Chronicle of Ancient History.' Hieronymus of Stridon translated it into Latin in the 4th century, and other continued it. Many historical works of the Byzantine historians are also chronicles. Most of the mediæval chronicles were by monks, especially by the Benedictines, who usually began their story with the creation of the world, and gave an abridged history of the events from the first chapter of Genesis to the immediate subject of their narrative. In their statement of facts they in general knew little distinction between fabulous and true history, were not inclined to question much either visions or miracles, and were accustomed to dwell as long on unimportant as on momentous events. Chronicles are valuable for determining historical facts when, like that of Eusebius, they contain materials from older works which are now lost, or when they relate events contemporary with a writer, and of which he was a witness; and they are always valuable as an illustration of the spirit of an age and the sentiments of a people. It is through them that nearly all the history of the Middle Ages has been preserved. Every European people has numerous mediæval chronicles.

Among the German chronicles may be mentioned that of Regino, abbot of a monastery in the forest of Ardennes, whose work extends from the Christian era to 907; that of Hermannus Contractus, entitled 'A Chronicle of the Six Ages of the World,' to the year 1054; that of Lambert von Aschaffenburg, which recounts the period from the beginning of the world to 1050 in brief, and from 1050 to 1077 in detail; that of Godfrey of Viterbo, giving a universal history to the year 1186, written partly in prose and partly in verse, and entitled 'Pantheon'; and a chronicle found in the collection of Pistorius, composed by an Augustinian monk, which extends from the Christian era to 1474. These were written in Latin and, with many other Latin chronicles, were col-

CHRONICLE OF THE KINGS OF ENGLAND — CHRONOGRAM

lected and published at Hanover in a series of volumes entitled 'Monumenta Germaniæ Historica.' The oldest historical book in the German language is a rhyming chronicle, consisting of 83,000 verses, written by Ottokar von Horneck, in the 13th century, and of nearly the same antiquity are the chronicles of Rudolf von Ems and Jansen Enekel, both having the form of poems, and furnished with notes by their authors. France is rich in chronicles, universal and particular, written in Latin, French, and various provincial dialects. It was the fancy of the earliest chroniclers to give to France a Trojan origin. Eginhard, the son-in-law of Charlemagne, chronicled the deeds and talents of that emperor in his 'History of Charlemagne.' The first of the chroniclers who wrote in the popular language of France was Geoffroi de Ville-Hardouin, who lived in the 12th century, and was an actor in the events which he describes. The 'Chronicles' of Froissart (q.v.) embrace the events occurring from 1325 to 1400 in England, Scotland, France, Spain, Brittany, and the Low Countries, setting forth in detail the feasts, spectacles, and all the pageantry, of feudal times, and enlivened throughout by Froissart's shrewd comments and observations. Of the strictly English chronicles, the earliest is that by Geoffrey of Monmouth, a monk of the 12th century, tracing the history of Britain through a series of imaginary kings, from Brutus, a son of the Trojan Æneas, who founded the British state many centuries before the Christian era, to Cadwallader, who was said to have lived 689 A.D. There is also the 'Anglo-Saxon Chronicle,' extending from the beginning of the Christian era to the death of King Stephen (see **ANGLO-SAXON LITERATURE**). The collection of chronicles edited by Holinshed in 1577 embraces a history of England to that year, a history and description of Ireland by Stanishurst, and a history of Scotland translated by Hector Boethius. 'The Chronicle of the Kings of England,' by Sir Richard Baker, published in 1643, is a history of England from Roman times to the death of King James I. It was a very popular work, and was afterward continued to the death of George I., but is not now considered accurate history.

Chronicle of the Kings of England. See **CHRONICLE**.

Chronicle of Paros. See **CHRONICLE**.

Chronicles, Books of, the last of the historical books of the Old Testament, forming only one book in the Hebrew canon. Its arrangement after the Books of Kings, and its division into two parts, is the work of the Septuagint (q.v.). The Hebrew name means "words," or, rather, "acts of the days," and is thus much the same as our "journals" or "annals." The title given to it by the Seventy was "Paraleipomena," meaning either "remains" (of other historical works), or "things omitted." The usual and very appropriate name "Chronicles" was given to it by Jerome. According to its contents the book forms three great parts: (1) Genealogical tables interspersed with geographical, historical, and other remarks (1 Chr. i.-ix.). (2) The history of the reigns of David and Solomon (1 Chr. x.-2 Chr. ix.). (3) The history of the kingdom of Judah — excluding that of Israel — from

the separation under Rehoboam to the destruction of the Jewish state by the Chaldæans (2 Chr. x.-xxxvi.), with a notice in the last two verses of the permission granted by Cyrus to the exiles to return home and rebuild their temple. The Chronicles accordingly traverse nearly the whole field of Old Testament history, and present many points of contact with the earlier scriptures, historical and prophetic, more especially, however, with the books of Samuel and of Kings. How far the author of the Chronicles may have made use of these books cannot be determined, but that he did not solely rely upon them is evident from the number of titles of books referred to by him as authorities, sometimes on matter not contained in Samuel and Kings, or, if mentioned in them, yet with greater brevity than in the Chronicles. A considerable portion of the matter contained in the Chronicles is much the same as that in Samuel and Kings, but many particulars recorded in these books are entirely passed over, while others are more fully related in the Chronicles. A certain quantity of matter also is peculiar to the Chronicles. That these books form one of the latest compositions of the Old Testament cannot admit of doubt. Its reference, already mentioned, to the decree of Cyrus respecting the restoration is sufficient evidence of this. With regard to the author there is not the same certainty, but strong arguments can be adduced to prove that Chronicles and the Book of Ezra are by one hand, and a common opinion is that Ezra was the author of both.

Consult Movers' 'Kritische Untersuchungen über die Biblische Chronik'; Keil, 'Apologetischer Versuch über die Chronik'; and the commentaries of the German writers, Bleek-Wellhausen, König, Wildeboer, etc.

Chronicles of the Canongate, a collection of Sir Walter Scott's stories published in two series. The first series (1827) contains 'The Highland Widow,' 'Two Drovers,' and 'The Surgeon's Daughter'; the second series (1828) contains 'The Fair Maid of Perth.'

Chronicles of Clovernook, a story by Douglas Jerrold, published in 1846. Clovernook is a "hamlet wherein fancy has loitered away a truant hour"; and under the guidance of the "Hermit of Bellyfulle" the author explores Clovernook, and discourses of it. The book charms by its quiet humor, the grace of its fancy, and the benevolence which characterizes even its satire.

Chronicles of Froissart. See **CHRONICLES**.

Chronicles of the Schönberg-Cotta (shèn'-bërg kôt'tä) **Family,** a novel by Mrs. Elizabeth Charles, published in 1863. It is the story of a family during the period of the Reformation in Germany, as told chiefly by Friedrich and Else, the oldest children. The book is written with an effort after the archaic style, and has much of the simplicity and directness of the old chronicles. It is interesting and has proved a great favorite, though accurate scholarship finds fault with its history.

Chron'ogram, a device by which a date is given in Roman numerals by printing certain letters of an inscription larger than the others; as in a motto of a medal struck by Gustavus Adolphus in 1632: ChrIstVs DVX; ergo trIVMphVs. The value of C and the other capitals equals 1632, MDCXVVVVII.

CHRONOGRAPH — CHRONOLOGY

Chronograph, *krön'ō gräf*, the name given to various devices for measuring and registering very minute portions of time with extreme precision. Benson's chronograph is, in principle, a lever watch with a double seconds hand, the one superimposed on the other. The outer end of the lowermost hand has a small cup filled with a black viscid fluid, with a minute hole at the bottom, while the corresponding end of the uppermost is bent down so as just to reach the hole. When in operation a string is pulled, whereupon the bent end of the upper hand passes through the hole and makes a black mark on the dial, instantly rebounding. This chronograph, which is sometimes called a stop-watch or a split-second fly-back watch, registers to one tenth of a second. The chronograph for astronomical use is connected by electricity with the pendulum of an astronomical clock, which makes a mark on a sheet of paper at the beginning and end of each swing. By touching a spring on the appearance (say) of a particular star on the field of a telescope, an intermediate dot is made, and by measuring the distance of this from either of the extremes, the exact time can be ascertained to 1-100 of a second. The first chronograph used was invented by Prof. Locke of Cincinnati, about 1850, and was only a slight modification of the Morse telegraphic instrument.

Chronol'ogy, the science of dates, or of arranging events in order of time. Two steps in human progress were requisite for its existence: the invention of material records, since memory would not transmit exact sequences of events on any considerable scale; and the adoption of some recurrent astronomical period, neither too short nor too long, as a measure of time. The pictograph, developed into a system of writing, and the Peruvian quipu, or knotted cord, are the chief of the former. The fixing of the year by the Babylonian astronomers was the only feasible specimen of the latter: the month being too short for a measure of long periods, and even the year becoming too formidable in numbers for the limited counting power of the ancients. Between the creation of these raw materials, however, and the construction of a simple and universally applicable system for even one country, thousands of years elapsed in which the chaos of unsystematic systems is still the difficulty and often the despair of antiquarians.

For a satisfactory chronology there is a third requisite,—a fixed epoch to count from, no matter what: as in Babylonia the accession of Nabonassar; in Greece the hypothetical institution of the Olympian games; in Rome the imaginary foundation of the city; in Christendom the arbitrarily fixed birth of Christ; with the Mohammedans the Hegira of the Prophet, etc. But, obvious as this seems, it is in fact a very late device of civilization. Herodotus and Thucydides, in the most splendid intellectual age of Greece, wrote history without a date, or any apparent recognition that one was needed. The sequence of events was preserved; but that these need be related to an arbitrary point in the past is an artificial conception, created by the accumulation of practical inconveniences. These would seem to have differed in each country which independently invented it: the scientific and business ones in Assyria, historical in Greece, administrative in Rome. Others bor-

rowed the system when its utility was manifest; but older societies were satisfied with a ruder scheme. Their science and business was alike undeveloped; their historical sense was satisfied with a few dramatic episodes, and even the order of events was heroically confounded; and when it became necessary to keep public records, their unit was a reign, or they dispensed with units altogether and dated by some notorious event. Thus the Babylonians dated their business and official tablets "the year he brought Nannar of Nippur into a house," "the year he overran Karkhar," "the year he overran Karkhar a second time," "the year divine Bur Sin became king, etc.; on exactly the same principle as a modern mother dates events in the year the second child had the measles. Dating by the year of a certain king's reign is a natural system, still preserved in English statutes: they are not the laws of 1663 or 1860, but "4th Car. II.," "24th Victoria," etc.

In Assyria, as early as the 14th century B.C., a system was begun of dating by "eponyms," or the names of the chief officers of state, in annual succession, with the chief events in the year; each new king's name being entered on his accession. Thus: "Edsur-sarabe governor of Gozan. Revolt in city of Ashur. In month Sivan sun was eclipsed." (Three intervening entries.) "Pan-ashur-lamur governor of Arbela. Revolt in city of Gozan. Pestilence." In Rome, it was "in the consulate of" certain persons; in Athens, "in the archonship of"; and so on. Obviously, if the regular succession of functionaries is preserved for a long time, as in Assyria it was for centuries, it will furnish a perfect chronology provided one date can be fixed in the series. This has been done in several cases, and the chronology of some sections of ancient history has been accurately reconstructed over long periods. The most certain authentication is by some astronomical phenomenon whose date can be fixed by calculation; and several of these priceless data are casually mentioned by old records or historians. Thus, the mention by an Egyptian papyrus of a rising of Sirius, in connection with the overflow of the Nile, fixes the accession of Usertes III., fifth king of the 12th dynasty, between 1876 and 1873 B.C.; the oldest certain year-date or approximate date in history yet discovered, and by a happy chance, in a country the most empty of chronological data. (The accuracy of Naram-Sin's date as near 3750 B.C. is still a battleground.) The most usual of these phenomena recorded are eclipses of the sun, from the terror inspired by the darkening of the sky; fortunately for history, as the mention of them has furnished several invaluable dates. The Assyrian eponym canon for several centuries has been fitted with accurate dates by the eclipse recorded in the first entry above, 763 B.C.; the same one is mentioned in the Bible (Amos viii. 9) as occurring in the reign of Jeroboam II. Even when we cannot be certain by itself which eclipse was meant, it is rare that other synchronisms do not fix the limit. Thus, an important date in the kingdom of Lydia is determined by an eclipse which was either 610 or 585 B.C., and other circumstances make the latter date probable.

When positive evidences fail, the only method of research is by *synchronism*, or fixing the date of an event by its connection with some

CHRONOLOGY

other event or person of known date. Fortunately, the records afford considerable help in this, if less than could be wished: they mention international battles, captures, treaties, appeals, threats, correspondence, etc., where one date must apply to both. Noted examples of this are the biblical records as to relations of Palestine with Assyria, Egypt, Tyre, etc.: sometimes confusing events and dates, occasionally confounding persons, and needing correction from other sources, but still of extreme value. Another specimen is the Assyrian "synchronous history" of the relations between Assyria and Babylonia, a tablet of about 800 B.C. When we come down to classic times, these synchronisms are the very basis of historical work on those periods. There is also a synchronism of arts, products exchanged between countries, systems of writing, etc., and even to some extent of institutions; which, though demanding expert knowledge and careful judgment, is often of the first value. On this basis much of the Homeric and pre-Homeric history of Greece is taking shape, and even the origins of China can perhaps be related to Babylonia.

The chronological sense of different races presents extreme diversities; but it is fairly accurate to say that none of the older ones had any appreciable amount except the Babylonians, and that in them and their pupils, the Assyrians, it was early and remarkably developed. Their dated records (in the primitive fashion above) go back to the third millennium B.C. at least; the Assyrians eponym canon antedates by many centuries any similar attempt elsewhere; and the Babylonians were much the first to adopt an epoch. On the other hand, their co-founders of the earliest civilization, the Egyptians, were utterly destitute of it; and the dates in their history back of the time of close contact with Babylonia, where synchronism can be utilized, are almost pure guesswork. Beyond 2000 B.C. the divergences of estimated Egyptian dates among the most authoritative scholars vary from 500 to 1,500 years, and even down to 1500 B.C. there is often 100 or 200 years' difference; and only the vaguest inferential proof is available. The Hindus, the Chinese, the Jews, the Greeks, were nearly as devoid of chronological instinct. The case of the great Greek historians has been mentioned; and the vague Jewish "forty years," for a generation or an indefinite long time is familiar and not conducive to accurate chronology.

The obscurity due to lack of dates in general was of course enhanced by the fact that each state counted from its own events or persons, so that in place of one problem, the historical antiquary has scores. The chief method—for many ages the only one—by which this Babel of chronologies was finally reduced to uniformity over large areas was political absorption and the disuse of provincial systems. Even when fixed epochs came to be adopted, though the continuity of history was assured, the international confusion was not lessened nor comparative chronology made easier, as each selected a different epoch; and the same remedy only was operative here. Nor, indeed, for some time did even the individual system become the accurate instrument of research it is now; for the succession was not at first of years, but of annual magistrates, as with the Assyrians, Athenians, and Romans, sometimes more vaguely of kings

and priests. Moreover, with one dubious exception the date of the epoch was not that of its adoption, but centuries back; and the dates affixed by the new system to former events were often wildly fanciful, as was that of the very event which furnished the starting point. The first epoch ever used, so far as known, was the accession of Nabonassar of Babylonia 747 B.C.; it is generally believed to have been used from the beginning, but this is less probable now than formerly. The Roman era was the foundation of Rome, somewhere about 750 B.C. according to Roman writers; it is not known when it was first adopted, but probably not before the 2d century B.C. The Greek reckoning was from the alleged foundation of the Olympic games in 776 B.C., quite as apocryphal as the other; it was first used as a basis of calculation by Timæus of Sicily in the 3d century B.C. It furnishes a scientific one when the year of the Olympiad is mentioned, which is not always, so that a margin of three years is left. Note the curious fact that all three epochs begin within a quarter century or so of each other, though the last two are merely guesswork. It seems incredible that the year, apparently the most simple and obvious of natural units, was first suggested and used in 194 B.C. by Eratosthenes, the great Greek editor, mathematician, geographer, and chronographer. Of course it had been employed for thousands of years as a unit within other units, such as reigns, but not alone in sequence from a fixed epoch. The Olympiad, however, for reasons given below, held its own till the middle of the 5th century. Even after the official adoption of the Christian era,—which, like its predecessors, antedated its use by centuries,—centuries elapsed still before it was employed to the exclusion of other systems. Many other methods of dating, local or ecclesiastical, flourished beside it, and made nearly as much labor necessary in modern as in ancient times to synchronize dates. An acquaintance with these is indispensable to the study of the chronicles, charters, and other legal and Church documents of the Middle Ages.

Still another cause of the imperfection of early chronological methods was the difficulty found by the masses in grasping large numbers. Hence, it became the practice to divide the time into cycles of a small number of years, and number by the years in a cycle. The Olympiad was a refined form of this. Our own system of reckoning by centuries is another, only by its decimal form it expresses both ideas at once. Instead of saying "the 3d year of the 20th century," as "the 3d year of the 40th Olympiad," we say a term of addition, and say "nineteen hundred(s) and three." The Chaldæans had their saros of $6,585\frac{1}{3}$ days, or 18 years; the Romans, their indiction of 15; and the Chinese and other Asiatic nations still use a cycle of 60. The European cycles, however, as the metonic of 19 years still used for computing Easter, were mostly used to regulate the calendar rather than to compute dates; but they are often extremely useful as an additional method of verifying these.

Babylonian: Era of Nabonassar.—This prince seems for a very brief time to have thrown off the Assyrian yoke and restored Babylonian independence. It was almost immediately lost; but he succeeded in imposing a new dating system which convenience main-

CHRONOLOGY

tained, or else later gratitude looked back to him, under the glories of Nabopolassar and Nebuchadrezzar, as the pioneer of Neo-Babylonian greatness. At any rate, the era is fixed at 26 Feb. 747, from astronomical data collected in Chaldæa by Callisthenes, a general of Alexander the Great. It is the basis of the once famous Canon of Kings, or Mathematical Canon, preserved in Ptolemy's works, and previous to the era of archæology our one source of Mesopotamian history. The Alexandrian Greeks also used this era till their adoption of Julius Cæsar's reformed calendar, 25 B.C. The Babylonian year was different in length from the Julian of $365\frac{1}{4}$ days, and the conversion of Nabonassar years into years B.C. is a matter of delicacy, necessitating a knowledge of the month and day for certainty. Tables have been drawn up for this purpose.

Olympiads.—It is now pretty generally admitted that the early lists of victors in the Olympic games are fictitious, and that the foundation of the games cannot be assigned a date, our first authentic knowledge beginning with the 6th century B.C.; but this is indifferent to the method of calculation which assumes a beginning in 776 B.C. They were celebrated every fourth year in the summer solstice; and as the Olympic year began sometimes with the full moon before and sometimes with the one after the solstice, to save trouble and perpetual recomputation it was reckoned as beginning the 1st of July. Hence, the Olympic years cannot be synchronized with ours year by year; the second half of the one corresponds with the first half of the other, and the month must be known for accurate conversion. Therefore, in years before Christ, when the event happened between January and June, inclusive, subtract the number of the Olympic year from 776. Thus: the oligarchy of the Four Hundred was deposed in June Ol. xcii. 1: $4 \times 91 + 1 = 365$; $776 - 365 = 411$ B.C. Socrates was executed in May Ol. xcv. 1: $4 \times 94 + 1 = 377$; $776 - 377 = 379$ B.C. If it took place in the latter part of the year (as did the immense majority of the familiar incidents in Greek history—all the great battles, for physical reasons, the deaths of Pericles and Cleon, etc.), subtract the sum as aforesaid from 777. Thus, the battle of Plataea was fought in September Ol. lxxv. 2: $4 \times 74 + 2 = 298$; $777 - 298 = 479$ B.C. If the year is after Christ, subtract the number of the Olympic year from 776 in the first case, from 777 in the second. The Olympiad was only used by historians; it is never found on coins or inscriptions. A new Olympiad was instituted by the Roman emperors, beginning with 131 A.D., and is used on some coins and inscriptions, but struck no deep root.

Macedonian Era, or Era of the Seleucidæ: also called by the Jews *Era of Contracts*, because their Syrian governors compelled them to use it in civil business, and styled by the writers of the Books of Maccabees the *Era of Kings*.—This epoch dates from the foundation of the Syro-Mesopotamian monarchy by Seleucus Nicator, Alexander's general; assumed to begin with his occupation of Babylon 311 B.C., 12 years after Alexander's death. It was used not only in the Seleucid empire, but by the Greek states on the east coast of the Mediterranean generally; was followed by the Jews till the 15th century, and is said to be in use by some Arabians even yet. It was the great

Eastern date for many centuries; but it is one of the most difficult to convert into terms of Christian years, from the astonishing variety in the beginnings of the year (which in different countries and among different sects varied from the vernal equinox to 28 October), and from the variation in length of year, some using the Egyptian year of 365 days, some the Julian of $365\frac{1}{4}$. The usual computation is to place the beginning of 312 Seleucid on 1 September in the Julian year preceding the first of our era. Therefore, to reduce a Seleucid date to ours, subtract 311 years 11 months.

Era of Alexander.—This is used by some Greek historians, dating from his death 325 B.C.

Era of Tyre.—This begins 19 Oct. 126 B.C. To reduce it to our era, subtract it from 126 if B.C., subtract 125 from it if A.D. This date is used only on medals and in the acts of some councils.

Era of Rome.—The date of the foundation of Rome, as related to the Olympiad epoch, is differently assigned by different authors: by Fabius Pictor at Ol. viii. 1, autumn (747 B.C.); by Polybius at Ol. vii. 2 (750); by M. Porcius Cato at Ol. vii. 1 (751); by Verrius Flaccus at Ol. vi. 4 (752); by Terentius Varro at Ol. vi. (753). As all the dates were figments, each Roman writer followed which he chose, and sometimes varied from one to another. Livy generally follows Cato, sometimes Fabius Pictor; Cicero follows Varro, as does Pliny, in general; Dionysius of Halicarnassus follows Cato. The modern writers usually follow Varro, supported by Censorinus, who specifically says the festival of the Palilia in April was the anniversary of the foundation. The Romans had two kinds of year: one for business, public or private; and the consular year, which their annalists follow. The former began with the calends of January. The latter had no fixed time of beginning, but commenced with the installation of the consuls, which happened as chance and politics dictated; it is the one generally used by the Latin and Greek historians down to the 6th century A.D., however. But in the computations of the Roman era the year begins with 21 April. After Cæsar's regulation of the calendar, the year began with January, much to the disgust of the Roman poets, who thought the spring was the real beginning, as, of course, it is.

Cæsarean Eras.—Several attempts were made to establish time eras from actions of Cæsar and Augustus, one of them very successful. The *Cæsarean Era of Antioch* commemorated Cæsar's victory at Pharsalia 48 B.C.; it was used by Evagrius in his 'Ecclesiastical History.' The Syrians and Greeks, however, placed its beginning 11 months apart. The Julian Era began 1 Jan. 45 B.C., and commemorated the reformation of the calendar by Cæsar. The *Era of Spain* or *of the Cæsars* commemorated the completion of the conquest of Spain by Augustus, and began 1 Jan. 40 B.C.; for many centuries it was the one era of Spain and Portugal, and generally of the Roman provinces subdued by the Visigoths, not only in the Iberian peninsula, but in southern France and in Africa. Several of the councils of Carthage, and that of Arles, also dated from this, though after the 9th century the year of the Incarnation was usually joined with it. It was not disused in Castile till 1382, and in Portugal not altogether till 1422 or later. The calendar being Julian,

CHRONOLOGY

all its dates are reduced to ours by merely subtracting 38. There was an *Era of Actium*, commemorating that battle, fought 3 Sept. 31 B.C. The Romans began it 1 Jan. 16 Julian (30 B.C.); the Egyptians, 29 August; the Eastern Greeks (who used it till the 9th century), 2 September. The latter called it the *Era of Antioch* (not the one mentioned later), and that city struck medals with it. There was also an *Augustan Era*, beginning 27 B.C., the year in which Augustus received that title.

Jewish Eras.—The Jews came under foreign rule before they had invented an epoch, or even developed periodic magistrates; and their annals, except for synchronisms, are nearly as baffling as the Egyptian. Their first internal chronology is after the Macedonian era was forced on them by the Seleucid officials; their religious matters, however, were regulated by their own calendar, in which the civil and sabbatical year began (as now) about the autumnal equinox, the ecclesiastical and legal year about the spring equinox. They also made computations of the time from the Creation (see paragraph below), but their dates do not depend on it till modern times. After the Dispersion they were obliged to conform to the periods of other nations, in order to have their festivals celebrated uniformly; and they adopted a cycle of 84 years (a transformed Greek cycle). The time of its beginning is not certain, one author placing it at 162, and another at 291 B.C. In 46 B.C. the Christians adopted it, and used it partially till the Council of Nice; they then, and the Jews in 360 A.D., substituted the metonic cycle of 19 years, which the latter still employ. Till the 15th century they continued to date from the Macedonian era; since then they have adopted a Creation era, which they date 3,760 years 3 months B.C. Their dates cannot be reduced to ours without expert knowledge of their involved calendar.

Creation Eras.—To emphasize their separation from paganism, and avoid participation in pagan observances connected with the calendar, the Christians early began to reckon time from the supposed date of the creation of Adam according to the Jewish Scriptures. Aside from its resting only on the adding up of impossible and inconsistent genealogies, the problem was further confused by there being three texts of equal authority to work from,—Hebrew, Samaritan, and Septuagint,—all irreconcilably variant. One author collects 120 different computations of the true date; another says he has collected over 200; and 300 have been reckoned; and the estimates vary over 3,500 years, from 3,483 to 6,984 years before the Christian era. None of them have any scientific standing, but for two centuries the Christian world generally accepted as a working hypothesis Archbishop Usher's (1650) figure of 4004 B.C., which is still used in some Bible appendices and similar works. Several earlier ones, however, obtained considerable footing, and two of them are not yet disused. It is of course as useful as any other arbitrary point, like the Olympic Games or the foundation of Rome; and has the advantage of requiring only one continuous figure, in place of a break in the centre like the Christian era. But its controversial character, and the satisfaction of marking off the time after Christ's coming as the beginning of a new era, have caused the latter system to supplant it. Of

the others, the chief are: (1) *Era of Constantinople*, still employed in the Greek Church, and used by the Russians till the time of Peter the Great. This begins 5,508 years 4 months before the Christian era. The civil year begins 1 September; the Church year on the spring equinox or 1 April. To find the current year corresponding to a Constantinople year, if the event took place before 1 September, subtract 5,508 from the date; if later in the year, subtract 5,509. (2) *Era of Alexandria*. This was adopted by the Christians of Alexandria on the computation of Julius Africanus, who reckoned 5,500 years from the creation of Adam to the birth of Christ, but placed the latter three years earlier than the current reckoning, so that our era would begin 5503 Alexandrian. After the accession of Diocletian in 284, however, they dropped 10 years, both from the year since the Creation and since the Incarnation, making in fact two eras instead of one. To convert this era into our own, in the first 8 months of the year subtract 5,502 up to and including 5786 Alexandrian, after that date, 5,492; in the last 4 months, 5,503 and 5,493, respectively. This era was used by the Coptic Church till the 15th century, and is still retained in the Abyssinian. (3) *Era of Antioch*. The Syrian Christians, early in the 4th century, adopted Julius Africanus' reckoning as above, but dropped 10 years from it as the Alexandrians had already done; placing the Incarnation, however, as in our own era, three years later than the Alexandrian. As regards the Creation, therefore, the two eras are seven years apart up to Diocletian's time, and then coincide; as regards the Incarnation, the Antioch is three years less before that time and seven years later after it. Dates in this system are reduced to ours, as in the reformed Alexandrian calendar above.

Era of Diocletian, subsequently named Era of Martyrs.—At the same time that the Alexandrians changed their Creation era as above, they established a new and shorter one from the accession of Diocletian, 29 August (first of the Egyptian year) 284. The second name given implies that an attempt was made to start it from 303, the date of Diocletian's edict of persecution, but if so it was unsuccessful, as indeed a mere perpetuation of a strife was likely to be. The era is still used by the Copts of Egypt and the Abyssinians. The change from the Egyptian to the Julian calendar, and the peculiar complications it has introduced into the conversion from that era to ours, are too intricate to detail here. To make the change, add to their date 283 years 240 days in common years; if the date is between 30 August and the end of the year in the one before leap year, add 283 years 241 days. But the Ethiopians do not reckon the years continuously from the beginning: at the end of each 532 years (that is, 28×19 , or the solar and lunar cycles multiplied together) they begin again with 1.

The Christian Era.—It is not generally realized how modern this epoch is in general use. It was introduced into Italy 533 A.D. by Dionysius Exiguus ("the lean"), a Roman abbot; was not introduced into Gaul (France) till the 8th, and not in current use there till the 9th; and came into use in England only in the latter part of the 8th. In Latin countries the current scheme before that was the cycle of indiction (below). Any uniform date is so useful that

CHRONOMETER

its defects may be overlooked. That of having a double set of numbers, forward and back, is not serious. Perhaps the chief inconvenience in calculating backward is that of calling the year preceding the era 1 B.C. instead of 0; thereby making the leap years on the backward series fall on the odd years, 1, 5, etc., or else making 7 years between the first one previous and the first one after. Astronomers rectify this by calling the first year previous 0. For the different dates on which the beginning of the year has been placed, see CALENDAR. Dionysius fixed the birth of Christ in 754 of the Roman Era, but he began the year 1 with the Annunciation, 25 March of the year preceding. In ecclesiastical and common usage it has begun at Christmas, Easter, 1 March, and other dates. In England from the 7th to the 13th century it was on Christmas; in the 12th the Annunciation began to be used as well, and from the 13th till 1752 remained paramount. The different beginnings of the year must be carefully taken into account in studying mediæval history.

Cycle of Indiction.—This was a period of 15 years, whose object has been already explained. It was generally used in the Western or Latin empire for several centuries before the Christian Era became general. It began in the year 313, or was referred to that year as a start. There were three, differing only as to the beginning of the year: (1) The Constantinopolitan, beginning in September, like the Greek year; generally used in the Eastern or Greek empire, and sometimes in France. (2) The Imperial or Constantinian, attributed to Constantine the Great, called also the Cæsarean. It began 24 September, and was used by old French and English chroniclers. (3) The Roman or Pontifical, beginning on Christmas or 1 January as custom varied; often used in papal bulls, and sometimes in old French writers. To find the number of any year in the Indiction, add 3 to the date (our era), divide by 15, and the remainder is the number. If the remainder is 0, the year is the fifteenth or last of the cycle.

Armenian Era.—This starts from the Council of Tiben, 9 July 552, when the Armenian schism began by condemnation of the acts of the Council of Chalcedon. The Armenian civil year is the Egyptian year of 365 days, out of all measure with others; their ecclesiastical year begins 11 August, and has the Julian calendar. They also use the Creation Era of Constantinople along with their own, dating documents with both on occasion. In business with Europeans they employ our era and our year. To convert their civil dates to our era, multiply the number of Armenian years by 365; add the number of days from 1 January to the given date; subtract 176; the remainder will be the number of days from 1 Jan. 553 to the given date; reduce this to Julian years, add 552, and this gives the date in the Julian year, old style. Add the requisite number in the Gregorian calendar if desired. In ecclesiastical reckonings, add 551 years 223 days. In leap years, if the date is between 1 March and 10 August, subtract one day from the above.

Mohammedan Era.—This commemorates the Hijra or Hegira (flight) of the Prophet from Mecca to Medina, 622 A.D. It does not, however, date from the flight, but from 68 days previous, 16 July, or as some have it, 15 July. The methods of computation are too complicated and uncertain to be given here: Mohammedan chro-

nology is one of the most treacherous of subjects, and even experts disagree and go astray.

Persian or Gelalcan Era.—This begins with the accession of Yezdegird III. to the throne of Persia, 16 June 632. Till 1079 the Persian had the random Egyptian year, 365 days without intercalation; it was then reformed by Omar Khayyam, the great poet and astronomer, under Malek Shah, to a degree almost as accurate as the Gregorian. There were seven successive leap years once in four years, but the eighth was deferred till the fifth year. This method was once universal in Persia, and is still followed by the Parsees of India. Owing to the days of error accumulated by the old year, the day of beginning is thrown back, so that the Persian year can be converted into ours by adding 631.

Hindu Eras.—The philosophers divided the duration of the world into four *yugs* or ages, of which three are past, and the present corrupt one, the *kali-yug*, is alone historical. It begins 3101 B.C. and includes several others in use. The Era of Vikramaditya, from a Hindu Augustus who may or may not be historical, is reckoned from 57 B.C. This monarch is generally attributed to the 5th or 6th century if real, and the epoch is thought a sidereal one. The Era of Salivahana is 78 A.D. This is used in southern India, and commemorates an equally dubious ruler. The Fusli Era, used in revenue transactions all over India, is not uniform, but the most usual begins 590 A.D.; it seems to be a Mohammedan one, and to correspond roughly to the Hegira. The Bengali Era is another of the sort, and is set at 631. There are also others which are used in different provinces. The 60-year cycle is employed, its date being variously set.

Chinese Chronology.—This rests on cycles of 60 years, the mathematical tribunal fixing their start at 2277 B.C. But since 163 B.C. the Chinese writers have used periods called Nienhao, each beginning with the accession of some emperor, and named after him, as with English laws, and ending when he or some successor chooses to begin a new period. Tables of Nienhao are therefore needed to identify the years.

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Chronom'eter (Gr. *χρόνος*, "time" + *μέτρον*, "measure" = "time-measurer"), an instrument designed to measure time with great accuracy, and much used in scientific work and for the determination of longitude at sea. The marine chronometer bears a strong superficial resemblance to a watch, except that it is larger and is mounted upon gimbals, so that the motion of the ship may affect it as little as possible. In its mechanism it differs from a watch chiefly in the design of its escapement and balance-wheel. The usual form of escapement, as invented by Le Roy about 1765 and greatly improved by Earnshaw and Arnold some 15 years later, is shown in Fig. 1.

In the ordinary watch the balance-wheel is in connection with the train of wheels leading from the mainspring continuously, or nearly so; but in the chronometer it is free from these during the greater part of the time, so that its natural period of vibration is more nearly realized. A is the escape-wheel, which is in gear with the other wheels of the instrument and is prevented from free rotation by means of the locking-pallet, D. B is a disk (technically

CHRONOMETER

known as the "impulse-roller") secured to the same staff, or axis, as the balance-wheel. F is the "detent spring," which serves to return the light frame, G, and the locking-pallet, D, to the position they have in the illustration, after the detent has been tripped by the balance-wheel. A set screw is provided for preventing the locking-pallet, D, from being drawn too far into the escape-wheel, but this has been omitted in the illustration for the sake of greater clearness.

When the mechanism is in the state shown, the balance-spring should be free from strain; but the balance-wheel is moving with its maximum velocity in the direction (let it be supposed) of the arrow, so that in another instant the discharging-pallet, H, will trip the detent by momentarily withdrawing the locking-pallet, D. The escape-wheel, A, is then free to rotate until again arrested by the locking-pallet, D; but as it does so it engages the impulse-pallet, C, and accelerates the balance-wheel. After the escape-wheel has been arrested by the locking-pallet, the balance-wheel continues its excursion until the energy of its motion has all been expended in winding up the balance-spring. The balance-spring then preponderates, and the wheel returns to the opposite extreme of its swing without disturbing the locking-pallet, D; the discharging-pallet, H, merely raising the light gold spring, E, as it passes the detent. In most chronometers the balance-spring is made in the form of a helix instead of a flat spiral.

The balance-wheel is also compensated for change of temperature, though this feature can hardly be said to constitute a point of difference between a chronometer and a watch, since practically all of the better grades of watches are now similarly compensated. The effect of an increase of temperature upon the rate of a chronometer (or watch) is of a dual nature. If the instrument keeps correct time at one temperature, then, unless some mode of compensation is provided, it will lose time at all higher

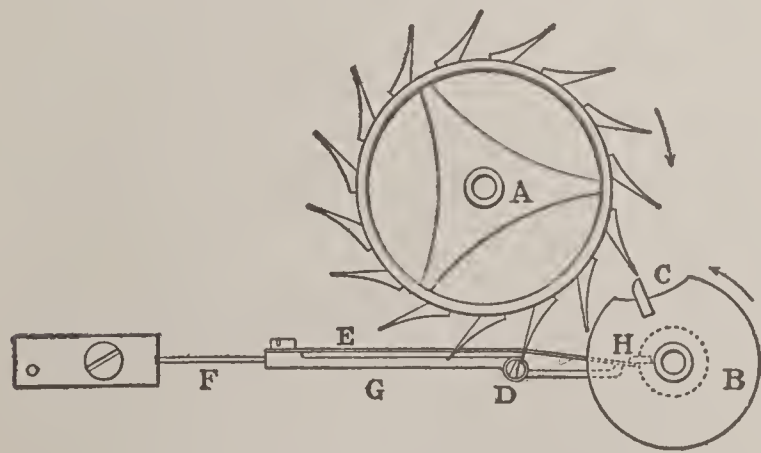


FIG. 1.—Chronometer Escapement.

temperatures, because (1) the strength of the balance-spring is less at higher temperatures, and (2) the wheel itself is greater in diameter on account of its natural expansion, so that it has a greater moment of inertia, and hence responds more sluggishly to the action of the balance-spring. To counteract these effects as far as possible, certain weights are provided along the rim of the wheel, and the wheel is so designed that as the temperature rises these weights are automatically thrown nearer to the axis of rotation. The moment of inertia of the wheel is thereby reduced, and the wheel is

caused to respond to the weakened spring with precisely the same readiness as before. The essential parts of the balance-wheel of a marine chronometer are shown in Fig. 2. The rim is

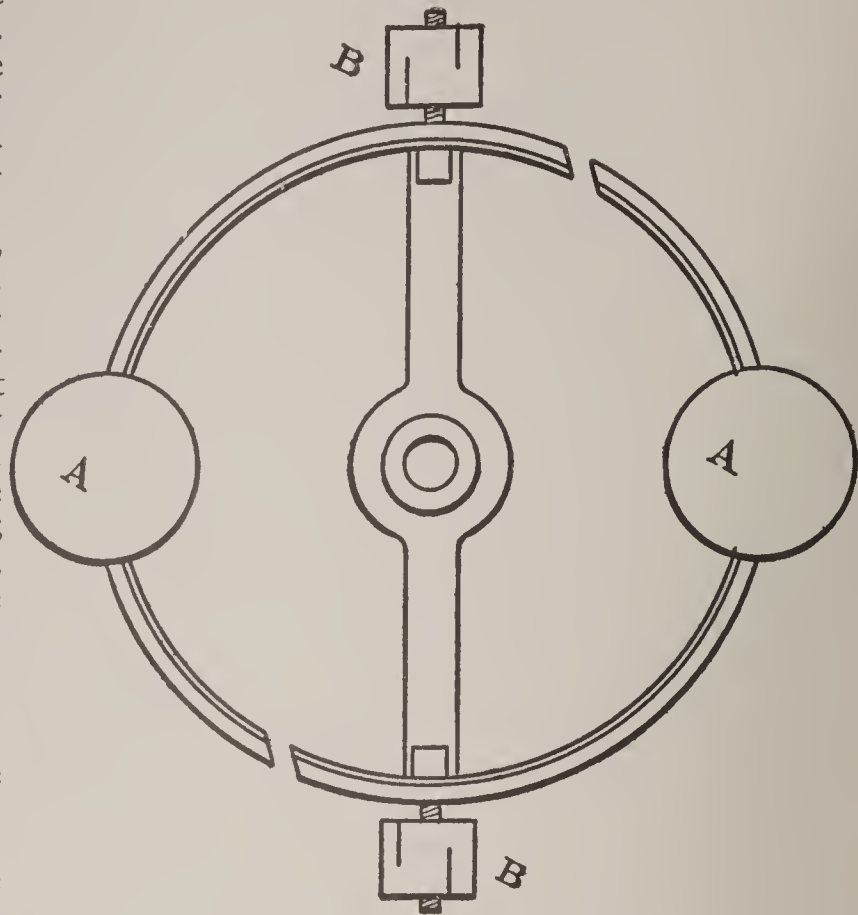


FIG. 2.—Balance Wheel of Marine Chronometer.

divided by transverse cuts into two equal, semi-circular segments, each of which is supported near one end; and it is built up of two concentric metal strips, of which the inner is steel, while the outer (which is twice as thick) is of brass. As the temperature rises the brass expands more than the steel, so that the rim-segments are deflected inward, and the weights, AA, are caused to approach the axis (or "staff") of the wheel. The two masses AA must always be opposite one another, in order that the balance may not be thrown out of poise; but they are slotted so that they may be slid along the rim. If a chronometer keeps correct time at one temperature, but loses at a higher temperature, the compensation is not sufficient, and the masses AA must be shifted toward the free ends of the rim-segments. If it gains at the higher temperature it is over-compensated, and the masses AA must be shifted toward the fixed ends of the rim-segments. In practice it is found to be impossible to adjust the masses so that the instrument shall be perfectly compensated at all temperatures. In fact, the theory of the balance shows that there are only two temperatures at which the chronometer can be expected to keep correct time, though these two may be selected arbitrarily, and the instrument adjusted accordingly. In marine chronometers the temperatures so selected are usually 45° and 90° F., and at intermediate temperatures the instruments will gain. Hartnup, the director of the Liverpool Observatory, concluded, as the result of experiments upon 1,000 chronometers, that the error in rate from imperfect compensation may amount to 1.5 seconds per 24 hours at temperatures 15° F. above or below either of the points at which the balance is standardized, when the balance-spring is of steel. With palladium springs the error is smaller. When the

balance has been compensated for temperature as accurately as possible, the moment of inertia of the wheel is adjusted so that the chronometer will keep correct time at the standard temperatures, by means of the slotted nuts BB. These turn upon screw-threads that are secured to the rim near the central arm, where their positions will not be sensibly affected by changes of temperature. If they are caused to approach the rim, the moment of inertia of the wheel is lessened, and the chronometer runs faster; and *vice-versa*. The slots in BB are provided so that the nuts may grasp their screws spring-tight, and so avoid backlash. (For full information on these matters and many others connected with time-pieces, consult F. J. Britten's 'Watch and Clockmakers' Handbook.')

Chronoscope, krõn'õ-skõp, an ingenious instrument, due to Sir Charles Wheatstone, for the purpose of estimating the duration of certain luminous phenomena, such as the electric spark, which according to ordinary means of measurement, appear absolutely instantaneous. It is founded on what is known as persistence of the impression on the retina of the eye. When a burning stick is whirled rapidly through the air a line of light is seen, the impression that the eye receives from the bright point in one position remaining long after the point has moved to a new position. Wheatstone views the electric spark in a small steel mirror revolving with enormous, but measured, velocity, and having a motion arranged, so that, were the light permanent, the object would appear to describe a complete circle. If then the phenomenon be instantaneous, a mere point of the circle will be seen, but if it have a duration shorter than the time of a revolution of the mirror, but still not infinitely short, the image will stretch out into an arc of the circle proportionate in length to the duration. The principle has been employed to show the discontinuity of certain flames which from persistence of vision appear continuous. These, when viewed in a mirror revolving rapidly, appear as a number of points or streaks of light arranged at intervals along the circle.

Chrosperma, krõ-spër'ma, a monotypic genus of plants of the natural order *Melanthaceæ*; the bunch-flower. The single species (*Muscatoxicum*) is commonly known as fly-poison, so called from its deadly effect on flies and similar insects. It abounds in dry sheltered soil from Arkansas and Tennessee eastward along the seaboard of the United States, in some sections reaching high altitudes.

Chrudim, hrõo'dëm, Austro-Hungary, a town and capital of a circle of the same name of Bohemia, situated 62 miles southeast of Prague on the river Chrudinka. It is a walled town and contains an old church and a Capuchin convent. It has manufactures of cloth; and the horse markets held here are the most important in the empire. Pop. 13,000.

Chrysal (krĩs al) or the **Adventures of a Guinea**, a satirical novel by Charles Johnstone, published in 1760. Chrysal, the spirit inhabiting a guinea, passes through many hands, from the prince's to the beggar's, and tells its own story, which is chiefly the adventures of those in whose possession it is for the time being.

Chrysalis, krĩs'a-lĩs, the pupa stage in butterflies, succeeding the caterpillar. During this time the insect eats no food, living upon the fat stored up by the larva. (See PUPA.) The chrysalids of butterflies differ from the pupæ of moths in being often ornamented with brilliant golden spots which have given origin to the name "chrysalis" or "aurelia." Also the body is often strengthened or protected by tubercles situated on the head, back, and sides. They are either suspended head downward by the tail, or rest horizontally, with a thread passing around them to hold them securely. Many, if not most, chrysalids are protected from observation by their colors, which harmonize with the color of the object to which they are attached. Thus, the chrysalis of the milkweed butterfly (*Anosia archippus*) which is suspended among the pale-green leaves of the milkweed and does not hibernate, is of a pale-green tint; while those of *Papilio turnus*, or of *Pieris*, are gray, and so spotted with light and dark marks as to harmonize with the neutral tints of the boards or fence to which they are attached. These colors and markings are apparently due to the effects of light and shade. These tints are determined at the period when the caterpillar is about to pupate, or become a chrysalis, when the integument is soft and moist. Poulton found, by subjecting the partly formed chrysalis to artificial surroundings of different colors, that the breeding boxes, when lined with black paper, produced dark chrysalids; when lined with white, light-colored, or green ones, or when lined with gilt, they produced chrysalids of a distinctly golden color, more completely so than occurs in nature.

Certain chrysalids have been found to exhibit negative phototropism (q.v.); that is, are directly sensitive to light. They will, while suspended by the tail, change their position if sunlight strikes them, and move so as to keep in the shade, from a pendant to a horizontal position, through an angle varying in different species of from 45° to 70° or even 90°. Too much light, especially direct sunlight, seems to be injurious to them, and the movement is one of protection.

Chrysanthemum, krĩ-săn'the-mũm, a genus of herbs and sub-shrubs of the natural order *Compositæ*. The very numerous species are natives mostly of the cooler parts of the northern hemisphere, but some have become introduced and established in the southern hemisphere as weeds, having escaped from gardens. They are generally hardy, white or yellow-flowered, annual or perennial, and of easy cultivation. Except *C. cinerariæfolium* and *C. coccineum*, the flowers of which are used to make insect powder (q.v.), the species have small economic use, though some, notably *C. leucanthemum*, the ox-eye daisy, is a troublesome weed upon badly managed land in the United States. *C. segetum*, the corn-marigold, and *C. frutescens*, the marguerite, are cultivated for ornament, especially in Europe, where they are native.

But the most important species are *C. indicum* and *C. morifolium* (*C. sinense* of some botanists). These are the parents of the popular autumn flowers known as "mums" and chrysanthemums, the varieties of which in Europe and America are numbered by thousands, and vary greatly in size, form, and color. So great is the

CHRYSAROBIN — CHRYSOCOLLA

diversity that fanciers speak of the varieties as belonging to certain types, of which 11 are recognized: Single, double, large, small, few-flowered, many-flowered, anemone-flowered, and various forms of the ray flowers, such as incurved, reflexed, etc. The size ranges from the "pompon," which may be less than an inch in diameter, to the "show," which may exceed eight inches in diameter. But with all this range of form and color the varieties are almost scentless, or have a somewhat disagreeable odor. These varieties are mainly cultivated under glass, since they do not reach perfection in the open air. They are propagated almost wholly from cuttings, which are taken from the parent plant after it has flowered. The cuttings are grown in a cool greenhouse until spring, when the young plants, then in pots, are placed in partial shade for the summer and kept as stocky as possible. In autumn they are forwarded until they blossom, after which they are destroyed, new cuttings having been taken.

For exhibition purposes the plants are watched and tended with the most minute attention, the superfluous buds and stems being removed while still tiny. Sandy or clayey soil is found useful by various growers, but whatever its character it must be rich and rather porous. Attention to fertilization, watering and cultivation are essential. For out-door culture the large-flowered varieties are unsuited, but the hardy pompons, which are usually free-flowering, are more satisfactory. Though the season of the indoor chrysanthemum is only about six weeks long, this flower ranks fourth in importance in the United States as a commercial flower, about \$500,000 worth being used annually.

The literature dealing with this flower is voluminous, probably ranking next in extent to that dealing with the rose. Eighty-three books are listed by C. Harman Payne in the 'Catalogue' of the National Chrysanthemum Society (1896). Other references to literature are given under the title Chrysanthemum in Bailey's 'Cyclopedia of American Horticulture,' which should be consulted for descriptions of various species, types, etc., and for methods of propagation, cultivation, and management. Consult also: Scott, 'The Show Chrysanthemum and Its Cultivation'; and Bulletins 112, 136, and 147 (1896-8), of the Cornell University Agricultural Experiment Station.

Chrysarobin, krī-să'rō-bīn, a neutral principle extracted from goa-powder, a substance found deposited in the heart wood of *Vouacapa-poua araroba*. It is an extremely irritating substance and is not used internally. Externally, combined with an ointment base, it is useful in a number of chronic skin affections.

Chryseis, the daughter of Chryses, a priest of Apollo. She was captured by the Greeks in the Trojan war, and became the portion of Agamemnon. When he refused to restore the daughter at the request of her father, Apollo listened to the prayer of his priest, and sent by his arrows pestilence and death into the Greek camp. Agamemnon found himself obliged to yield up the maiden, but then robbed Achilles of the fair Briseis. Hence arose the dissension between these heroes which so long delayed the conquest of Troy, and with which the story of the Iliad opens.

Chryselephantine, krīs''ēl-ē-fān'tin, in Greek art, statues which were overlaid with ivory and gold. The frame or body of the statue upon which the ivory plates were fastened was usually of wood, and the gold was used for the garments and hair. The most celebrated of these statues were the colossal works of Phidias, of which the largest was the Pallas of the Parthenon, 26 cubits high, representing the goddess in armor covered with a long robe.

Chryses, a name appearing several times in Grecian legend: (1) a priest of Apollo, who, according to Homer, came to the Grecian camp to ransom his daughter Chryseis, who had become the prize of Agamemnon. (2) The son of Neptune and Chrysogeneia, and the father of Minyas. (3) Was the son of Minos and the nymph Pareia. He lived on the island of Paros with his brothers Eurymedon, Napholeon, and Philolaus, and was put to death by Hercules because he had, in concert with them, murdered two of his companions. (4) A son borne by Chryseis to Agamemnon after her return to her father, but alleged by her to be the son of Apollo. He assisted his step-brother and step-sister, Orestes and Iphigenia, in murdering King Thoas.

Chrysippus, Greek Stoic philosopher of Cilicia: d. about 206 B.C. He was distinguished for his skill in debate. He was the principal opponent of the Epicureans, and is said to have written 700 different works, mostly of a dialectical character; but of these no complete work is extant. He died at a great age.

Chrysis, a priestess of Juno, who by falling asleep suffered the sacred fire to destroy the temple of her goddess, and was at last burned herself.

Chrysobalanæ, krīs-ō-bāl'a-nae, a plant family closely allied to the *Rosaceæ*, of which it is sometimes considered a sub-order, comprising 12 genera, with 180 species, all trees or shrubs. Many of them, as the cocoa-plum, produce edible fruits. So do several species of west Africa, the seeds of which are sometimes substituted for or used to adulterate sweet almonds, which they resemble in taste and appearance. From the seeds of a member of the family growing in the Himalayas an oil is extracted.

Chrysoberyl, krīs-ō-bēr'īl (Gr. χρυσοβήρυλλος, "golden beryl"), a native aluminate of glucinum (or beryllium), having the formula $GlO.Al_2O_3$, and crystallizing in the orthorhombic system. It is transparent or translucent, with a vitreous lustre and a green or yellow color. The variety alexandrite (q.v.) is green by daylight and columbine-red by artificial light. The finer varieties are used as gems. It has a hardness of 8.5 and a specific gravity of from 3.5 to 3.84. Chrysoberyl occurs in Brazil, in Ceylon, in the Urals, and in Ireland; and in the United States it has been found in Maine, Connecticut, and New York. See also CAT'S-EYE.

Chrysocolla, krīs-ō-kōl'la, a hydrated silicate of copper, having the formula $CuSiO_3 + 2H_2O$. It is cryptocrystalline and usually occurs in opal-like or earthy masses, or as incrustations, or not infrequently with botryoidal surface. When pure it is translucent and of sky-blue color, but when impure it is often opaque and dull green, brown or black. Its hardness varies



CHRYSANTHEMUM.

CHRYSOGONUM — CHRYSOSTOM

with its composition, from 2 to 4, and its specific gravity from 2 to 2.2. Its lustre varies from vitreous and shining in the pure mineral to dull and earthy. It is found in copper mines in all parts of the world, especially in Cornwall, England, Australia, and Arizona. The chryso-colla of the ancients, meaning "gold glue," was apparently a body used to facilitate soldering. The name is still applied to borax which is thus used. Malachite, the green carbonate of copper, was doubtless confused with chryso-colla.

Chrysogonum, krīs-ō-gō'nūm, a monotypic genus of the natural order *Compositæ*. It is found throughout the eastern seaboard of the United States, in dry soil, from southern Pennsylvania to Florida, blossoming in April and July. It is a perennial herb with large heads of tubular and radiate flowers.

Chrysolite, krīs'ō-līt (Gr. κρυσόλιθος "bright yellow stone"), a native silicate magnesium and iron, sometimes also containing titanium, nickel, or tin. It occurs massive and granular, and also in orthorhombic crystals. It is transparent or translucent, and usually green or yellow in color, with a vitreous lustre. It has a specific gravity of from 3.27 to 3.57 (according to its composition), and a hardness of from 6.5 to 7. Chrysolite occurs in volcanic rocks, as in basalt and basaltic lavas, and it is also found in dolomite and in certain varieties of limestone. The finest crystals of the mineral come from Brazil and Egypt, and are known as "precious chrysolite." They are used to a certain extent as gems, and are sometimes confused with the emerald. Chrysolite readily passes by alteration into serpentine, and numerous large beds of the latter mineral are known to have originated in this manner. It is abundant in crystalline grains in some meteoric irons and stones. Peridot and olivine (qq.v.) are names frequently used for varieties of chrysolite.

Chrysoloras, Manuel, Greek scholar: b. about 1355; d. Constance, Germany, 15 April 1415. He was the first who, in modern times, transplanted Greek literature into Italy. The Emperor John Palæologus sent him in 1391 to Italy and England to ask for assistance against the Turks. Having thus become known in Italy he returned there about the year 1395, and was appointed professor of Greek literature at Florence, where he collected around him a great number of scholars of all ages and ranks, and excited universal enthusiasm as much by his dignity and the grace of his elocution as by the extent of his learning. From his school proceeded Leonardo Bruno, Poggius, Francis Philéplus, and other distinguished revivers of classical studies. He afterward taught with equal success at Milan, also at Pavia and Venice, and lastly at Rome. Pope Gregory XII. employed him in public affairs, and sent him with others to the Council of Constance, where he died in 1415. He should not be confounded with his nephew and companion in Italy, John Chrysoloras.

Chrysomelidæ, krīs-ō-měl'ī-dē, an extensive family of small beetles which have a hemispherical or ovate form, small, sunken head, and antennæ widely separated. All, and especially the typical genus *Chrysomela*, are very gaily colored,—blue, green, golden, or a mixture of brilliant tints. The most elegant American spe-

cies (*C. scalaris*) has the head, thorax, and under side dark green, while the wing-covers are silvery white, ornamented with small green spots on the sides and a broad irregular stripe down the middle of the back; the legs and antennæ are rust-red, and the wings rose-colored. These beetles inhabit trees, bushes, and plants, feeding, in their larval state, on the leaves. They include many species, as the potato-bug and the elm-leaf beetle, which do vast damage. Their eggs are laid on the leaves, and the grubs, which as a rule are protected by disagreeable odors and exudations, go into the ground to transform, and there spend their pupal life. The family is a very large one and is spread all over the world. See LEAF-BEETLES.

Chrysophanic (krīs-ō-fän'ik) Acid, the yellow coloring matter of rhubarb. It can be obtained direct from rhubarb by exhausting with benzol and purifying the crude product. It crystallizes in fine yellow tables. It is hardly soluble in water, but dissolves in ether, benzol, etc. With potash it gives a fine purple solution, and thus affords a delicate test for the presence of alkalis. It is also soluble, without decomposition, in strong sulphuric acid. Its acid properties are rather obscure.

Chrysophyllum, krīs-ō-fil'ūm, a genus of the sapadillo family (*Sapotacæ*), consisting of trees with milky juice, alternate leaves with numerous transverse closely aggregated ribs, and golden hairs on the under surface. In the West Indies the fruit (*cainito*) is esteemed a delicacy under the name of star-apple, which is fleshy, with several one-sided cells, or by abortion, with one. Seeds nut-like. Natives chiefly of southern United States, Africa, and India.

Chrysoprase, krīs'ō-prāz, a variety of chalcidony, colored apple-green by nickel oxide and prized as a semi-precious stone. It became popular a few years ago because of Queen Victoria's fondness for it. Silesia and Siberia long furnished a small supply, but recent discoveries in California have made it abundant and cheap. It also occurs in Oregon and North Carolina.

Chrysopsis, krī-söp'sis (from the Greek, signifying "of a golden aspect"), a genus of about 20 species of the natural order *Compositæ*, comprising nearly 30 species, natives of North America and Mexico. Commonly known as the golden aster.

Chrysostom, Dion (surnamed COCCEIANUS), Greek orator: b. Prusa in Bithynia about 99 A.D. He was first a Sophist, then a Stoic, and rose into high repute as an orator under Domitian. That tyrant, however, took offense at his freedom of speech, and he was obliged to save himself by flight. He was afterward highly esteemed by Nerva and Trajan. About 80 of his orations are still extant. They are written in an affected style, but notwithstanding form a valuable contribution to our knowledge of ancient philosophy. They appeared first in a collected form at Milan in 1476.

Chrysostom, krīs'ōs-tóm or krīs-ōs'tóm, John, Saint, archbishop of Constantinople, greatest of the Greek Fathers of the Church: b. Antioch, the capital of Syria, about 347. His cognomen, the golden-mouthed (*chrysostomos*), he owes to his extraordinarily rich, fervid, and persuasive eloquence. In his youth

CHRYSOTILE — CHRYSTLER'S FARM

he attended the school of Libanius, a celebrated Pagan sophist, was his favorite disciple, and would have been his successor had he not been won for the service of the Church by his pious mother Anthusa. In accordance with the general usage of that time, he did not receive baptism till he had attained maturity, and then he lived devoted in religious contemplation and studious seclusion in a desert place for six years. There the austerities he practised undermined his strength, and being called back to Antioch by the bishop, he was ordained deacon in 381 and presbyter in 386. By his zeal, his urbanity, and his eloquence, he won to the Church, heretics, pagans, and Jews in great numbers; and his fame spreading to the capital city of the Eastern empire, he was, with the approval of the Emperor Arcadius chosen to be archbishop of Constantinople in 397. Here he led in the episcopal palace the life of an ascetic, eschewing the pomp and luxury of his predecessors, and out of the revenues of the see maintained numerous charities. Meanwhile his homilies or pulpit discourses, which are still extant, were even a stronger attraction for the masses than the shows of the amphitheatre. But he had many rivals, who left no means untried to blacken his character, his reputation for piety, zeal, disinterestedness, and for orthodoxy, and his life was accordingly full of trials and vicissitudes. His enforcement of the Church's laws regarding the relations between ecclesiastics and the female inmates of their households; his deposition of bishops for simony and licentiousness; the restraints he put upon the vagrant habits of the monks, called forth a host of enemies, who brought against him the charge of sympathizing with heretical monks of the Nubian desert who had been excommunicated by their ecclesiastical superior, Theophilus, patriarch of Alexandria. Theophilus now added himself to the malcontents of Constantinople, and he called a synod of bishops to be held in the imperial city to judge Chrysostom. But because of the menacing attitude of the common people, who were to a man loyal to their archbishop, the synod had to be held in the neighboring city of Chalcedon. To this synod Chrysostom was four times summoned, to reply to the charges that were to be made against him, but he ignored the summons, and was declared guilty of favoring the heresies of Origen. By order of the emperor Arcadius he was exiled to Nicæa in Bithynia; but so great was the commotion of the common people in Constantinople when the decree of banishment was published, that the emperor, alarmed, ordered his recall. The re-entry of Chrysostom to the city was attended with all the pomp of a Roman triumphal procession, and he abated no jot of his zeal for the repression of the evils of Church and state. His language was, as it had ever been, sufficiently emphatic, sufficiently plain-spoken, but his enemies put in circulation a spurious version of the opening passage of his first discourse after his return: he was reported by them to have commenced his address with these words in denunciation of the empress Eudoxia: "Herodias is again furious; Herodias again dances; she once more demands the head of John." The report was false, but the fate of Chrysostom was sealed. Barbarian troops were

brought into the city to overawe the commons while another synod was in session in the city: it confirmed the decree of the synod of Chalcedon. By decree of the emperor, Chrysostom was banished to Cucusus, a place in Mt. Taurus. The people of Constantinople, not to be restrained by the garrison of Gothic mercenaries in the city, set fire to the cathedral and the senate house on the day the decree was published; and Chrysostom, though absent, was a more formidable power than ever: his correspondence with bishops, both in the East and West arrayed the whole Catholic Church against Theophilus and the court of Arcadius. Indignant at the contumacy of the exiled archbishop, Arcadius ordered his transfer to a more inhospitable region still, the desert of Pityos: he died on the way thither at Comana, in Pontus, 14 Sept. 407, being then in his 60th year. His day in the calendar of the Greek Church is 13 November; in that of the Latin Church, 27 January. His last words are reported to have been "God be in all things praised." His works consist of homilies or discourses suggested by or illustrating passages of Scripture; commentaries on the sacred books; epistles, and treatises on the truths of religion, virtues and vices, etc. Consult: Martin, 'Saint Jean Chrysostome, ses œuvres et son siècle'; Perthes, 'Life of Saint John Chrysostom and His Biographers'; Tauscher, 'Life'; both in German; and a biography by Aime Puech, in English.

Chrysotile, kris'-ō-tīl, a variety of the mineral serpentine, occurring in silky fibres that are flexible and easily separated. It is commonly greenish in color. Its specific gravity is about 2.22, which is sensibly less than that of ordinary serpentine. It occurs abundantly in Canada, where it is known as "bostonite" and "asbestos." See ASBESTOS.

Chrystler's Farm, Battle of, the most discreditable American defeat, as Chippewa was the most brilliant victory, of the War of 1812, was fought 11 Nov. 1813. The expedition prepared in the summer and fall of 1813 at Sackett's Harbor, on Lake Ontario, to descend the St. Lawrence and capture Montreal, started 17 October under bad auspices. Aside from insufficient resources and the lateness of the season, the personnel was hopeless. The commander-in-chief alone would have ruined it. This was Maj.-Gen. James Wilkinson, termed by Scott, "an unprincipled imbecile," a mere cunning jobber, of neither military talent, firmness, nor even character to be respected, and despised by all the other officers. He had been appointed for the curious reason that New Orleans was not thought safe in his hands. Furthermore, he was prostrated with lake fever, as was his second in command, Morgan Lewis. Boyd, the third, was so incompetent that Jacob Brown, the one able fighting general, had threatened to leave the army rather than serve under him. Men cannot fight without leaders. The flotilla, battered by contrary winds, began the descent of the river 5 November. From this on, the British made progress slow and dangerous. Capt. Mulcaster, an able and daring naval officer, with several gunboats, harassed the rear, and 800 regular infantry co-operated with him, pouring musketry and artillery fire on the expedition from the opposite bank whenever possible, besides the batteries at Prescott. Brown's and

CHU-HI — CHUBUT

Macomb's brigades were landed on that side to clear the road; and by 10 November the flotilla had reached the Long Saut, and anchored for the night at Chrystler's Farm on the Canadian side. The next morning Brown marched down beside the rapids with his brigade, and Boyd was ordered to take the rest of the troops, some 2,000, with six field pieces, and guard the rear. Brown reported all clear, and the fleet was about to run the rapids when Boyd reported that the enemy was advancing in order of battle. Wilkinson was sick in bed and could give no orders; so was Lewis; and Boyd was left to fight his own battle. He did it as a weak commander usually does, by detachments, which the British crushed in detail, though they had but 800 against 2,000. The battle lasted from about 2.30 to 4.30, when Gen. Covington was killed and his brigade driven back in disorder. Then the whole American line gave way and retreated in haste. Wilkinson reported 102 killed and 237 wounded, and the British claim to 100 American prisoners is more likely to be true than Wilkinson's report of none. The British reported 22 killed, 148 wounded, and 12 missing. The American troops hurriedly re-embarked; the next morning the flotilla ran the rapids to Cornwall. There Wilkinson learned that his colleague, Wade Hampton, had ended operations for the season (see CHATEAUGAY), and at once went into winter quarters. Consult Henry Adams, 'History of the United States,' Vol. VII., chap. 8.

Chu-Hi, choo-hē', Chinese scholar and philosopher: b. 1130; d. 1200. As a student of the Chinese classics, he became widely known through his interpretation of the doctrines of Confucius, and became one of the founders of the Chinese school of speculative philosophy. He had a large number of disciples among the scholars, and they, under his direction, compiled a history of China in 59 books, which is still a standard work.

Chu-Kiang, choo-ke-äng', or **Canton River**, the "Pearl River" of the Chinese, is the lower part of the Pe-Kiang, and has a navigable channel of about 300 miles. Opposite Canton it is about one fourth mile wide, and is crowded with shipping up to 1,000 tons burden; larger vessels must tie up at a point 15 miles below. About 40 miles below Canton it is called "Boca Tigris," or "The Bogue."

Chub, a name given to various species of fishes of the family *Cyprinidæ* (q.v.), of which the river chub (*Hybopsis kentuckiensis*) and the creek chub (*Semotilus atromaculatus*) are the most important in the United States. The name is also sometimes applied to the roach (q.v.), and more rarely to certain marine fishes, as the rudder-fish. The river chub is abundant in rivers and creeks throughout the eastern United States, and may be known by its orange-colored fins and the tuberculate head of the males in spring. It reaches a length of 10 to 12 inches, and is a favorite with the less ambitious anglers in certain regions. The creek chub, or horned dace, is even more widely distributed, and inhabits brooks rather than rivers. It resembles the roach, but has a black spot in front of the dorsal fin and does not exceed a foot in length. The large black chub (*Acrocheilus alutaceus*), of the Pacific coast rivers, is known locally as chiselmouth, squaremouth, and hard-

mouth. The English chub (*Squalius cephalus*) is a much larger fish, attaining a length of two feet and a weight of eight pounds, and lives in mountain brooks as well as in rivers. It is a game fish of considerable importance.

Chub-mackerel, a fish (*Scomber colias*), found in immense numbers in the Mediterranean Sea. It is the "Spanish mackerel" of England.

Chubb, Thomas, English controversialist: b. East Harnham, near Salisbury, 29 Sept. 1679; d. Salisbury 7 Feb. 1747. He was a mechanic who employed his leisure in the acquisition of knowledge from the best English books which he could procure. In 1715 he published 'The Supremacy of the Father Asserted,' the perspicuity and argumentative skill of which obtained for it much notice. Of course a production assailing the orthodox faith did not pass without reply, and a controversial warfare commenced which lasted as long as his life. In 1730 he offered to the world his thoughts on a variety of topics, moral and theological, in thirty-four tracts, collected in a 4to volume, of which book Pope in a letter to Gay speaks with great respect. Various publications followed, for example, 'A Discourse Concerning Reason'; 'The True Gospel of Jesus Christ Asserted'; 'Inquiry into the Ground and Foundation of Religion,' etc.

Chubb Lock (so called from the name of the inventor), one of the most intricate of the many-tumbler locks which were first made in England by Barron in 1774. The locks of Chubb have obtained their celebrity partly from their superior workmanship, having more tumblers than usual, with the addition of a lever called the "detector," which is so fixed that, while it does not act under the ordinary application of the key, it cannot fail to move if any one of the tumblers be lifted a little too high, as must be the case in any attempt at picking. The bolt becomes immovably fixed, and thus, while rendering all further attempts at picking useless, gives notice that such an attempt has been made on the next application of the proper key. To draw the bolt after it has been tampered with, it is necessary only to turn the key a little farther forward, as in the process of overlocking; this pushes up a tooth at the end of the detector, restoring the lock to its original position, and the key is then free to turn in the ordinary way. These locks, which were patented as far back as 1818, maintained the reputation of being invincible until the celebrated locksmith Hobbs, of the United States, in 1851 succeeded in picking the most intricate locks of English workmanship, such as Chubbs, Bramahs, and Cotterills.

Chubut, choo-boot', Argentina, a territory in the northern part of Patagonia, so named from a river which drains a large part of the surface. Its area is about 90,000 square miles. Its principal interest lies in its Welsh settlement, which has remained almost wholly Welsh-speaking. The first settlers, 151, arrived in July 1865. Epochs in its history have been the abandonment of the colony in 1867; the subsequent return from New Bay; a 20 months' nearly complete isolation from the outer world, terminated in 1871. The principal town, Rawson, is situated about five miles from the Atlantic Ocean, and has a population of a few hundreds. English grain and roots are produced, and salt of good quality is found.

CHUCK-WILL'S-WIDOW — CHURCH

Chuck'-Will's-Wid'ow, a large, nocturnal bird (*Antrostomus carolinensis*) related to the whippoorwill, common in the Southern States of the Union. The name is an attempt to reproduce the note of the bird. It is fully 12 inches in length, and is one of the largest of American song-birds, and when uttering its call, opens its mouth enormously. The eggs are laid upon the ground, little or no attempt being made to form a nest. The bird is a voracious eater of insects, its large bristled mouth fitting it for catching flying objects.

Chuckwal'la. See LIZARD.

Chufa, choo'fa. See NUT-GRASS.

Chu'kor, or **Chicore**, a partridge (*Caccabis chukor*), the favorite game-bird of the foothills of the Himalayas.

Chumbul', a large river of Hindustan. It rises in Malwa, in the Vindhya Mountains, about 50 miles south of Oojein, flows north, enters Rajpootana, through which it runs northeast, and falls into the Jumna about 90 miles southeast of Agra, after a course of over 650 miles.

Chunam', in India, a name given to a very fine kind of quicklime made from calcined shells or from very pure limestone, and used for chewing with betel (q.v.). It is also used for plaster, being mixed with fine sand by wetting, and sometimes with various other materials added. It makes a plaster of great durability, capable of being highly polished, and suitable for decorative work.

Chunar-Ghur, chün-är'gër, India, a town, fortress, and invalid station in Hindustan, 17 miles southwest of Benares, on the Ganges. The fortress stands on a lofty rock rising abruptly from the river. Chunar was stormed by the British in 1764, and formally ceded to the East India Company in 1768. Pop. 12,000.

Chung-King, chüŋ-këŋ', China, a city in Szechuen, on the Yang-tze-Kiang, at its junction with the Kia-ling. It was declared open in 1890, and has acquired a thriving trade. There was a rebellion of the natives here in 1896-8, which checked progress. A railroad to centre at Chung-King is projected, and valuable coal-mines are to be worked. Pop. about 125,000.

Chuprah, chüp-rä', or **Chaprah**, India, a town of Hindustan, in Bengal, on the Gogra, near its junction with the Ganges, 32 miles west-northwest of Patna. It is narrow, but extends along the river for four miles. It has government courts and offices, government English school, and is a station of the German Lutheran Mission. Pop. (1901) 45,400.

Chuquisaca, choo-kë-sä'ka, Bolivia, a department in the southeastern part of the country, bounded on the north by the department of Santa Cruz, on the east by Brazil, on the south by the department of Tarija, and on the west by the departments of Oruro and Potosi. Its area is variously estimated at from 40,000 to 73,000 square miles, the southern boundary of Bolivia not having been definitely determined. The eastern portion is mostly level, the mountainous parts being in the west. There are large forests and grazing lands, and the soil, where cultivated, is found good for agriculture. Mineral deposits exist, the most valuable being silver,

of which some is mined. Among the other productions are wheat, coffee, sugarcane, and cacao. The capital of the department, and also of the republic, is Sucre (q.v.). The population is about 285,000, embracing 80,000 civilized Indians and 8,000 whites, the rest being wild Indians.

Church, Albert E., American mathematician and military officer: b. Salisbury, Conn., 1807; d. West Point, N. Y., 30 March 1878. He was educated at West Point and was professor of mathematics there 1834-78. His mathematical works include 'Elements of Differential and Integral Calculus' (1842); 'Elements of Analytical Geometry' (1851); 'Analytical Trigonometry' (1857); 'Elements of Descriptive Geometry' (1865).

Church, Alfred John, English translator and author: b. London 29 Jan. 1829. He was educated at Lincoln College, Oxford; was ordained in the English Church in 1853, and after holding several head masterships, was professor of Latin in University College, London, 1880-8; and rector of Ashley, Gloucestershire, 1892-7. Beside publishing translations of Tacitus and Livy, he is the author of 'Stories from Homer' (1877); 'Stories from Virgil' (1878); 'A Traveler's True Tale, after Lucian' (1879); 'Stories from the Greek Tragedians' (1879); 'Stories from the East' (1880); 'The Story of Jerusalem' (1880); 'The Story of the Persian War' (1881); 'Stories from Livy' (1882); 'Roman Life in the Days of Cicero' (1883); 'The Chantry Priest of Barnet' (1884); 'With the King at Oxford' (1885); 'Two Thousand Years Ago, or the Adventures of a Roman Boy' (1885); 'Carthage' (1887); 'The Count of the Saxon Shore' (1887); 'Three Greek Children' (1888); 'To the Lions' (1889); 'Burning of Rome' (1891); 'Pictures of Roman Life and Story' (1892); 'Early Britain'; 'Bacon'; 'Callias'; 'Heroes of Chivalry'; 'Lords of the World'; 'Helmet and Spear'; 'Spencer'; etc. His books have been widely read in America.

Church, Arthur Herbert, English chemist: b. London 2 June 1834. He was educated at King's College, London, the Royal College of Chemistry, and Lincoln College, Oxford. He was professor of chemistry in the Royal Agricultural College, Cirencester, 1863-79; and has filled the same position in the Royal Academy of Arts from 1879. He is the discoverer of the animal pigment known as turacin, and of churchite, a native cerium phosphate, and has published 'Precious Stones' (1883); 'English Earthenware' (1884); 'The Laboratory Guide' (7th ed. 1894); 'Food' (16th thousand, 1901); 'Josiah Wedgewood' (1894); 'Color'; 'Guide to Corinium Museum.'

Church, Benjamin, American soldier: b. Duxbury, Mass., March 1639; d. Little Compton, R. I., 17 Jan. 1718. He commanded forces with distinction in King Philip's war and in the famous battle of 1675 with the Narragansetts won renown. He captured and executed King Philip in 1676. 'Entertaining Passages Relating to King Philip's War' were compiled from his notes by his son Thomas.

Church, Benjamin, American physician: b. Massachusetts about 1710; d. 1776. He was graduated at Harvard; became noted for his patriotic writings during the decade preceding

CHURCH

the Revolutionary War, and was a leader in the "Boston tea-party." He secretly corresponded in cipher with the British, and, being detected, failed to exculpate himself. He was lost at sea while on a voyage to the West Indies.

Church, Francis Pharcellus, American editor: b. Rochester, N. Y., 22 Feb. 1839; d. New York City, 11 April 1906. He was the first publisher and editor of the 'Army and Navy Journal'; afterward, with his brother, he established and edited the 'Galaxy' magazine. He was a leading editorial writer on the New York *Sun*, and till his death was a proprietor of the 'Army and Navy Journal.' He published 'Life of Ulysses S. Grant' (1899); and 'Life of John Ericsson' (1891).

Church, Frederick Edwin, American landscape painter: b. Hartford, Conn., 4 May 1826; d. New York 7 April 1900. His earliest productions were views of the Catskill Mountains, among which he resided, and a view of East Rock, near New Haven, which attracted very favorable notice. In 1855 he visited South America, and found in the magnificent scenery of that country materials for several of his most admired pictures. After his return he executed his 'View of Niagara Falls from the Canadian Shore,' regarded by many as the most successful representation of the great cataract. Among his other works are 'The Heart of the Andes'; 'Cotopaxi'; 'Morning on the Cordilleras'; 'Under Niagara'; 'The Icebergs'; and 'Sunrise on Mount Desert Island.' After a visit to the Holy Land in 1868 he painted 'Damascus' (1869); 'Jerusalem' (1870); 'The Parthenon' (1871).

Church, Frederick Stuart, American artist: b. Grand Rapids, Mich., 1842. He studied at the National Academy of Design, and since 1885 has been a full member thereof. He has achieved note as a realist and is well known as a painter of figures and animals.

Church, George Earl, American soldier, engineer and explorer: b. New Bedford, Mass., 7 Dec. 1835. He was a member of the Scientific Exploring Expedition in South America in 1858; served in the Army of the Potomac 1862-5; and was war correspondent in Mexico for the New York *Herald* 1866-7. He made explorations in South America 1868-72; was United States commissioner to visit and report on Ecuador 1880; represented American Society of Civil Engineers at London Congress of Hygiene and Demography in 1891, and was president of the Geographical Society of the British Association in 1898. He is now resident in London where he is vice-president of the Royal Geographical Society.

Church, Irving Porter, American civil engineer: b. Ansonia, Conn., 22 July 1851. He was educated at Cornell University and has been professor of applied mechanics and hydraulics in the College of Civil Engineering there, from 1892. He has published 'Statics and Dynamics for Engineering Students' (1886); 'Mechanics of Materials' (1887); 'Hydraulics and Pneumatics' (1890); 'Notes and Examples in Mechanics' (1892).

Church, John Adams, American mining engineer: b. Rochester, N. Y., 5 April 1843. He was graduated from the Columbia School of

Mines in 1867, was professor of metallurgy in Ohio State University 1878-81, and was four years in the service of Li Hung Chang in Mongolia, engaged in developing silver mines. He has published 'Notes on a Metallurgical Journey in Europe'; 'The Comstock Lode'; 'Report on Artesian Wells in Arizona.'

Church, Richard William, English clergyman: b. Lisbon 25 April 1815; d. London 9 Dec. 1890. He took a first-class at Oxford in 1836, and soon after was elected to a fellowship at Oriel. From 1853 to 1871 he held the rectory of Whatley, near Frome. In 1871 he became dean of St. Paul's Cathedral, London. In 1854 he published 'Essays and Reviews,' and thereby took rank almost at once as one of the most graceful and scholarly writers of the day. His university sermons 'Human Life and its Conditions' (1878); 'The Gifts of Civilization' (1880); and 'The Discipline of the Christian Character' (1885), are profound contributions to religious thought. Other works by him are 'Life of Anselm' (1871); 'The Beginning of the Middle Ages' (1877); 'Dante: an Essay' (1878); 'Spenser' (1879); 'Bacon' (1879); 'The Oxford Movement' (1891); 'Miscellaneous Essays'; 'Occasional Essays.' See 'Life and Letters of,' (1896).

Church, Samuel Harden, American writer: b. Caldwell County, Mo., 24 Jan. 1858. He is a railway official in Pittsburg, Pa., and has written 'Oliver Cromwell: a History' (1874); 'John Mannaduke,' a romance (1897); 'Corporate History of the Pennsylvania Lines West of Pittsburg' (1898-1900).

Church, William Conant, American journalist: b. Rochester, N. Y., 11 Aug. 1836. He became the publisher of the New York *Sun* in 1860, and was war correspondent of the *Times* (1861-2). In conjunction with his brother Francis (q.v.) he established the 'Army and Navy Journal' (1863), and the 'Galaxy' magazine (1866), and has been a contributor to the 'Century' and other periodicals.

Church. This word probably comes from the Greek *kyriakos*, dedicated to the Lord; the Scottish *kirk* and German *kirche* are forms of the same word. It has various meanings; in its widest sense it denotes the whole community of Christians, and was thus used by the New Testament writers. In more restricted significations it denotes a particular section of the Christian community differing in doctrinal matters from the remainder, as the Roman Catholic Church, the Protestant Church, etc.; or to designate the recognized leading church of a nation, as the English, Scotch, or French Church. It is applied in a sense which is manifestly too narrow, when it denotes merely the officers of the church, or clergy. In yet another sense it signifies the building in which Christians assemble for the worship of God, and, referring the reader to the separate articles on the sects into which the community is divided, we shall confine ourselves here to a few remarks, historical and descriptive, on *church* as denoting the edifice appropriated to Christian worship. When in the time of Constantine the persecuted Christians emerged from their meeting-places in upper rooms and in the Roman catacombs to bask in the sunshine of imperial favor, no buildings could be found fitter for their purposes than the

CHURCH — CHURCH AND STATE

basilicas of Rome. The basilica was generally in the form of a parallelogram, with a semi-circular apse at one end, which was raised, being approached by a semicircular range of steps. In the centre of this apse was the raised seat of the quæstor or other presiding magistrate; on each side, upon the steps, were places for the assessors, or those engaged on the business being transacted. In front of the apse was placed an altar, where sacrifice was performed before undertaking public business of any importance. The area of the building was divided by two rows of columns, the central division or nave being by far the broadest; over the two smaller divisions or aisles a gallery was often raised. In the small dark and Pagan temple there was neither room nor light enough to conduct Christian worship, but in such a building as above described, the whole congregation of the faithful could meet and take part in the act of worship. The bishop naturally took the place of the quæstor, the priests that of the assessors. The altar on which the pious Pagan poured his libations at the commencement of important business served equally well for the celebration of Christian rites. When in course of time the separation between laity and clergy became complete, the apse was railed off and appropriated to the use of the clergy, then the raised part on which the altar stood was separated by pillars called *calcelli*, and not allowed to be profaned by the multitude. Another change was the introduction of a choir, or enclosed space in the centre of the nave, round three sides of which the faithful congregated to hear the gospel read from two pulpits built into its inclosure on either side, or to hear the services read or sung by the inferior clergy, who occupied its precincts. As time wore on other modifications were introduced; on the erection of new buildings, the symbolic form of the cross was generally adopted as the most suitable for a Christian building; the arms of the cross (the transept) were railed off by rows of columns as the main building had been; at the point of intersection of the transept with the nave a tower was raised, which was at times surmounted by a small spire; frequently two towers were placed at the angles of the entrance end of the edifice. Over the greater part of Europe the style which came to be usually adopted for ecclesiastical buildings was the pointed Gothic, as lending itself more readily to a more majestic and ornamental treatment than the graceful Greek with its columned portico and rounded tower. Circular churches, which were popular at an early date, have found little imitation. The structures which are among the most notable in point of size or historic interest are alluded to in the article on CATHEDRALS. The ordinary churches are generally long rectangular buildings, without transepts, and the tower is placed so as to form the principal entrance, or at one of the angles of that end of the church. Of late years a taste for a superior style of building to that hitherto prevalent has sprung up, even among the dissenting bodies in England, and the Presbyterians of Scotland. See ARCHITECTURE.

Church, an Organization of Christians. As understood to-day there are two widely different opinions regarding the meaning of a church, and both claim the New Testament as

authority, (1) that Jesus Christ established a definite Church with a code of laws pertaining to belief and government; (2) that he gave us only moral instruction and no definite laws of belief or discipline. Under (1) may be classed those who claim that Jesus Christ established only one Church, and that the churches mentioned by Paul and others of the early missionaries as recorded in the New Testament, were all parts of the one Church. Still others hold that the Christian Churches of the New Testament were each separate and distinct in government, but one faith. The Roman Catholic, Greek, Church of England, and all Christian organizations with any generally recognized form of government, whether by presbyters or by the congregation, may be classed under (1). Under (2) will come all who hold that to observe the moral code as taught by Jesus Christ is all sufficient, hence this division need not be treated under the head Church.

The Roman Catholic definition of Church is: "The congregation of all the faithful, who being baptized, profess the same doctrines, partake of the same sacraments, and are governed by their lawful pastors under one visible head on earth, the Bishop of Rome." This implies unity of faith, morals, and government. The Greek definition is the same except they do not recognize as the visible head the Bishop of Rome. The Church of England definition is: "A congregation of faithful men, in which the pure word of God is preached, and the sacraments be duly administered in all those things that are of necessity requisite to the same." In the further authorized explanation of this definition it is shown that the government is given to the bishops without any authoritative head. The same definition is in general use by all other Christian Churches, but in some the government is vested in presbyters, elders, or officers acting as elders; in others the government rests in the congregation or members of the church.

Under the names of the various Christian denominations may be found further information regarding particular doctrines and forms of government. See CHRISTIAN CHURCH; CHRISTIANITY.

Church-ale, formerly a church festival in England at which ale was drunk liberally; also the ale brewed for such a festival. The name is obviously compounded like bridal = bride-ale, scot-ale, clerk-ale, bid-ale, etc. The church-ales were usually held upon Whitsuntide, and two persons were chosen beforehand to preside over the feast, and divide out the victuals and drink voluntarily contributed by the parishioners. Sometimes the drink which had been brewed from malt given by the parishioners was sold about Whitsunday at the church for the support of orphans and poor, the repair of the church, and similar objects. The practice of holding church-ales with the corresponding games was denounced by the Puritans, and is not overlooked in Stubbs' 'Anatomie of Abuses.'

Church and State. Between these two institutions, in modern times, there has rarely, if ever, existed perfect harmony. This struggle, so long protracted, bids fair, unless some astonishing upheaval occurs, to last for all time. It has been a bitter one. It has involved large interests and brought to the forefront momentous

CHURCH AND STATE

discussions. It has fomented uprisings of all kinds and originated a literature of vituperation without parallel outside of political strife. It has been, not seldom, mere political contention. There has been much confusion of issues, yet the lines of division are visible throughout. The question has its historical side and its doctrinal features. In contemporaneous events it is reduced, practically, to a battle between one important Church and not a few of the civil powers. In Italy the recognition of that Church has reached the irreducible minimum. France has at last snapped the only link which, since the days of the Directory, constituted after all but a semblance of union. Everywhere at present we find ourselves confronted with a State using its power against a Church, or a State Church, or Church and State going their own ways, very little mindful of each other. Summarized, the history of the contest is that before the coming of Christ there was no Church in the sense in which it has been presented by Christianity in its many forms. The religions of antiquity, with the exception of that of the Jews, were for the most part unsystematized beliefs and a ceremonial which was either identified with the State or was a mere function thereof, dependent in a large measure on civil rulers. This is found to be the case in the great religions of the ancient world. The religions of the Egyptians, of the Assyrians and Babylonians, of the Iranians, of the early Sanscritic Indians, of the Phœnicians and Carthaginians, of the Etruscans, and of the ancient Greeks and Romans (Rawlinson). The religion of the Jews, as is sufficiently well known to all educated persons, was the essential element in their theocratic form of government. While this lasted friction was hardly possible. In captivity the Jews, as religionists, were more or less hampered by their conquerors. They were sometimes persecuted, sometimes unmolested. In general, a goodly amount of religious liberty was accorded them. The historic struggle for Church supremacy and independence began with Christianity. It met with opposition from the start. The antagonism germinated the day when Herod, his court, and all Jerusalem were troubled, because wise men came from the East and asked where is He that is born King of the Jews. It became more accentuated when Christ began to teach in public and more intensified when his disciples set out upon their missionary journeys. In the commencement of the 2d century the Roman empire, which was the whole known world, was agitated, and for 200 years thereafter the imperial State used all its powerful machinery to crush the Church out of existence. It is to be noted that whenever the State pressed heavily against the Church, the reason put forward was the weal of the State. This has always been the war cry. Under Constantine the Church entered the arena of universal activity as a collaborator in the task of civilizing the peoples. Acknowledged as the spiritual ruler, it gradually acquired a local habitation and a name as a temporal potentate. It became a world power. This success was the beginning of all the many disasters of the Church. Some say this external grandeur was the cause, others that it was merely the occasion, of every calamity by which the Church has been visited. Emperors granted her immunities

and promulgated laws in her favor. The wealth and position which she acquired (legitimately or not, according to the spirit of her founder or not, is still a problem for many) was a basis for her of independent action. From the preaching of Christianity at Rome, to the conversion of Constantine, the State persecuted the Church and refused to recognize the divine authority it claimed to possess. From Constantine to Charlemagne the civil power, while giving legal recognition to the Church, interfered in its government. From Charlemagne to a period approaching that of the Reformation, Church and State were closely united and there was a generally acknowledged subordination of the civil to the spiritual authority. During this last division of history, the Church was in possession to a very marked degree of the prize which she has lost, though still fights for; that is, she was admitted to have an independent sphere of action, a supremacy in all spiritual matters, and an undisputed title to the territory which in one or other way she had acquired and enlarged. She has been accused of greed and tyranny in her management of her temporal rights. In every age many foreswore their allegiance to her. Deserters from her camp counted peasants and princes. These either used or invoked the secular arm against her. The Arians and other dissenters did this. Modern nations were formed and the idea of individual independence became stronger and more general. The Eastern schism was open rebellion against the parent Church. The Orient went its own way through many vicissitudes and much bickering, until it was finally absorbed by the State. In that large portion of Europe there was no longer conflict, for ecclesiastical rule was swallowed up in that State Church which Peter the Great established and which he denominated the Orthodox. Constantinople had drawn Russia into the schism. From 1700 A.D. onward, Peter no longer appointed any one to the office of patriarch, but decreed a directing synod at St. Petersburg and placed himself at its head (1721). The secession of Martin Luther and his adherents revolutionized the condition of things. His doctrines and his alliances with princes brought about rupture after rupture with the old Church (1530). The followers of Luther discarded all Roman authority whether in temporal or spiritual matters. The Roman empire gradually split into fragments. Princes introduced the new creed into their respective States. The opposition to Rome grew apace. It ran like a tidal wave over Europe. The British Isles were drawn into the vortex. Henry VIII. declared himself head of the English Church. In France Gallicanism propagated a spirit hostile to the Church. Voltaire and the Revolution abolished every vestige of papal authority. A reaction began with Napoleon, who aimed at subordinating the supreme ruler at Rome to himself and to his power. There was a protest on the part of the pontiff. He was thrown into prison. At last a concordat was agreed upon between the consul and himself. Barring the revolutionary changes, the attitude of France has remained the same. The concordat was more or less religiously adhered to until these later times, when the French government violated nearly all its agreements and very recently annulled it, thus completely separating State from Church. The

CHURCH AND STATE

Chamber of Deputies has passed the bill effecting the separation of Church and State in France. Will it pass the higher house remains to be seen. The principles involved in the measure are destructive of all union between the two powers. The State neither recognizes nor salaries any form of worship. The exercise of worship is free under certain restrictions. French citizens, ecclesiastical as well as lay, are not all at one in their views regarding the nullification of the concordat. Some see in it a beginning of better days for religion just as not a few Catholics, the world over, are against any kind of a union anywhere between Church and State and think that the Roman pontiff is much better circumstanced now that he has no temporal rule, for the welfare of the Church and its mission. They hold that the Church won spiritually during the three first centuries—a period when the popes never dreamed of becoming civil sovereigns. Whether or not this view can be considered an orthodox Catholic view may be decided by a reference to recent papal utterances on the matter. It would appear that since the Reformation the only Church which maintains what it considers its prerogatives in relation to the State is that of Rome. Practically every other Church is a State one, or claims no rights as against civil government, and as a consequence is ignored by secular constitutions, or is an instrument more or less passive, of the kingdoms or principalities or republics of which it is a territorial part, or is so limited numerically and has so small a voice in general affairs that its demands challenge neither notice, nor censure, nor opposition, on the part of the State. Thus the struggle which for so many centuries shook the world is narrowed down to an antagonism between governments and Rome. The old Roman Church power has dwindled down to a very small area, without kingdom or weapons of defense. Its isolation is complete and absolute. As this Church holds views on the status of Church and State, as she still maintains the principles which for no short period directed national movements, her position demands investigation. What does this Church claim? What is the basis of that claim? To these two questions the Catholic Church has given an answer which goes back very far. The answer is found in all the papal documents in which the popes have touched on this subject. The reply has been very diligently elaborated by the great doctors and theologians and has introduced into what may be termed, without any implied reproach, Catholic Casuistry, a series of discussions which contain minutiae of argumentation exceeding the possibilities of this notice to compass. The following condensation will bring forward the very large outlines only. Civil power as well as ecclesiastical authority are of divine origin. Both aim at the welfare of humanity, the one in a higher, the other in an inferior degree. As both agencies are necessary for the betterment of the race, there must be union and not separation. Not only is union demanded by the nature of the common purpose, but subordination also, and in that subordination the place of supremacy must be ceded to the Church. Each power is distinct, yet each is to help the other. The duty of the State is to protect all the rights of every man, to provide for all a quiet and regulated ex-

istence, and, where necessary, to co-operate with the Church, whose divine character it is bound to recognize in the leading of all men to salvation. The Church has the right to require from the secular ruler, as from the individual Catholic, that he should receive from her hands the divine law and act in conformity with her interpretation of its precepts. The Church strengthens civil authority by imposing upon all her subjects that State power is of divine right, that secular governors are the anointed of the Lord. According to this view, in many ages the pope was looked upon as the head of the immense Christian family scattered throughout the earth. He cited before his tribunal both sovereigns and subjects, composed quarrels, inflicted spiritual penalties upon scandalous princes, and deprived of their dignities and rights those who refused obstinately to change their line of conduct. The pope was then regarded as the natural head and father of Christendom. Kings stood in need of the Church for things religious and the Church was protected by the laws of the State. If the warning voice of the Church failed to deter the evil-doer, the sword of the civil power was drawn in her behalf. The Church asserts her right, in virtue of her divine commission, to require of every one submission to her doctrine. "Each power remains sovereign in its own sphere, each is confined within limits perfectly defined and traced in conformity with its nature and special purpose. There is therefore a circumscribed sphere within which each of them exercises its own action, *jure proprio*, through its own right. Yet, as their authority is wielded over the same subject, it may happen that one and the same thing, though from a different cause, may be under the judgment and jurisdiction of both powers." This position the Church bases on the fact that to St. Peter, according to her view of Scripture and tradition, and to his successors, Jesus Christ confided the government of His Church; secondly, on the more exalted nature of her appointed end; thirdly, on the conduct of Christ and the apostles who never asked leave from civil rulers to evangelize and whose principle (Acts v.) was: "We ought to obey God rather than man." The Church declares that she proclaims the independence of secular power and she herself cannot interfere as long as State action does not infringe upon the laws of God and the rights of the Church and the spiritual interests and chief end of man are not endangered by legislation. In case of conflict, that is to say, when in mixed questions, the two authorities impose upon their subjects, who are the same persons, contradictory obligations, the State should yield to the Church. The foregoing are the principles affirmed by the Church and are the Catholic view of the relations which should exist between both. This doctrine is her doctrine to-day. A stand so peremptory and so unmistakable has not met with universal approval. Within the last 300 years it has been denied *in toto*. The opponents say the foundation on Scripture and tradition is insecure, that such a relation as Rome calls for is inadmissible, because the history of the past proves that it was always controverted in theory and practice, that it led to the denationalizing of peoples, that it incited to the worst of crimes, that it extinguished every spark of patriotism, that it called

CHURCH AND STATE IN THE UNITED STATES

for the universal empire of the Church, that it spoke for greed and tyranny and self-aggrandizement merely, that it crushed intelligence and battered down all the props of individual and collective freedom, that it fettered thought and clipped the wings of science, that it deflected nations on their march toward progress, and that it was a benighted doctrine and to be fought and execrated wherever it showed its head. Statesmen have scoffed at it and expelled its votaries as they would drive out anarchists and criminals. Laws in the most enlightened countries have been made to prevent, if not its existence, at least its logical effects. The widespread theory held by the powers to-day is either: no Church or absorption of Church by State or the subserviency of the Church to the State. It has assuredly gone hard with Catholics in many ages and under many governments. No one upholding the doctrine of Rome could be a citizen, was the expressed opinion of multitudes in America and everywhere. The Roman Catholic teaching on this point has angered governments because of two special questions, that of education and that of divorce. In recent times the Church has not been silent regarding the family and her protests have irritated many, while it has also been confirmed by the approval of men outside her pale. As the pope is now an isolated individual, stripped of all temporal power, the question of Church and State has become purely academic. It must not be lost sight of that, though no civil ruler, his spiritual legislation extends over some 250,000,000 subjects, who are more or less obedient to his commands, and that therefore the States not only now but as long as the papacy lasts will have to reckon with his influence and cannot afford to consider him as at any time a negligible quantity, and hence the question of Church and State is one which, concerning essential features, is not yet to be considered beyond discussion or likely to be closed. See FRANCE.

Bibliography.—Hooker, 'Ecclesiastical Polity'; Balmes, 'European Civilization'; Hallam, 'Middle Ages'; Gladstone, 'Essays'; Macaulay, 'History of England'; Taparelli, 'Diritto Naturale'; Philipps, 'Kirchenrecht'; papal encyclicals. This question is treated in nearly all dogmatic theologies of any note, and they are many, as well as in ecclesiastical histories.

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Church and State in the United States.

That an indispensable function of any government is the conservation of public morals, and that an indispensable method of achieving it is to enforce the public exercise of some religious forms, seemed axiomatic to most people in the 17th century. The tenet that religion is best promoted by leaving it to individual discretion was first evolved, naturally, by groups whose best hope was immunity, not establishment. These differing circumstances in the English colonies, with change of views from experience and change of policy from gain or loss of power, resulted in four chief attitudes of the colonial governments toward religion: (1) the establishment of a specific Church, and the taxation of the entire community to support it; (2) restriction of suffrage to church-members, without specifying the church—"theocracy"; (3) requirement of some church form and steady

parish service in communities, without establishment of a specific church or disfranchising individuals; (4) entire religious liberty.

The first type is found in the chief Southern colonies and New England. Virginia came first, then Carolina before its division, the "Fundamental Constitutions" (see CAROLINA, ORIGINAL CONSTITUTION OF) merely shaping in this respect the provisions of Charles II.'s charter; lastly Maryland in 1691, after overthrowing the tolerant proprietary government. Each, from the nature of the case, established the Church of England. In New England the form of establishment was peculiar and *quasi-casual*; it was not statutory nor specific, but rested on local taxation to support a church which, owing to circumstances, was at first always the Calvinistic Congregational Church. When other church bodies began to grow, this taxation was remitted to all who supported a church of their own; those who were not thus *bona fide* contributing members to another church paid their cess to the Congregational as before. The second type is represented exclusively by the early Massachusetts Bay and New Haven colonies. The former, 18 May 1631, when as yet there was no popular representation in the colony, enacted "that no man should be admitted to this body politic but such as are members of some of the churches within the limits of the same." This restricted suffrage to one fourth the adult males, and was repealed 3 Aug. 1664. The latter, 4 June 1639, agreed "that church members only shall be free burgesses, and they only shall choose among themselves magistrates and officers" for public business. This, of course, perished with the absorption of the New Haven into the Connecticut colony, in 1662. The third type has but one representative, New York, including the Jerseys. This was "the Duke's" (afterward James II.) constitution, and is not the only ground for a less harsh judgment on him than prevails. The fourth type includes Rhode Island, the product of a quarrel with Massachusetts theology and politics, in which the founder's views developed by force of circumstances as he went on; Maryland, founded by a Roman Catholic who would not have been allowed to establish his own religion; Pennsylvania, equally limited to seeking immunity from persecution; and Georgia, founded late by an enlightened philanthropist.

The Revolution swept away all vestiges of establishment. The Constitution of 1787 provided against a danger not likely to recur. Article VI. enacts: "No religious test shall ever be required as a qualification to any office or public trust under the United States." This, however, did not touch the real likelihood if bigoted sectarians should control the government; the State conventions held to ratify the Constitution, urged a clause to guarantee full religious liberty; therefore the First Amendment begins: "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof." Even this does not in the least debar individual States from doing it; but most of their constitutions decisively prevent that, not only by direct prohibition, but by enacting that no appropriation of public money shall be made to sectarian institutions. The stability of this provision, the impossibility of evading it, and its incalculable public value, have been proved many times over in the past half cen-

CHURCH CALENDAR—CHURCH OF THE NEW JERUSALEM

ture. In the early years of the Union, efforts were occasionally made to have the legislatures enact some test to confine the government to Christians, for fear of atheistic or Jewish control; or to Protestants, in fear of Catholic supremacy; but the absurdity of the first two, and the impolicy of the last, as well as the improbability of its need, have prevented any approach to success. The only serious problem that has arisen on this point is due to Mormonism, where the claim to free exercise of their religion and its dictates is complicated by one of its ostensible revelations enjoining polygamy. In 1882 Congress prohibited polygamy under severe penalties; and the supreme court held this not in conflict with the constitutional provision above cited.

Church Calendar. A systematic method of arrangement of the feasts of the Christian Church has long been in use, and the record of the time of these feasts is called the Church Calendar. Many of the feasts of the Church occur on a fixed day of the month, as Christmas, 25 December; All Saints', 1 November; Assumption, 15 August, and the feasts of the saints. The "movable" feasts are regulated from the feast of Easter Sunday. (For Easter see CALENDAR.) The fiftieth day after Easter Sunday is "Pentecost"; the eighth day after "Pentecost," "Trinity Sunday," etc. The fasts, except those of Lent, are regulated by the feasts, the records of which are found in the calendar. See also CALENDAR.

Church Discipline, the practice of the Christian Church in dealing with such of its office-bearers and members as have by public scandal caused hindrance to its common spiritual life. Its Scripture authority, resting on such passages as Matt. xvi. 19; xviii. 15 (*et seq.*), is further enforced in Paul's epistles and in the gospel and epistles of John. Discipline, in the ecclesiastical sense, means the laws which are intended to govern the subjects of the Church in their conduct, as distinct from dogmas or articles of faith, which affect their belief. These laws may be based upon the Scripture and tradition or they may be the outgrowth of the condition of the times.

Church of England. See ENGLAND, CHURCH OF.

Church, Fathers of the (*patres ecclesie*), teachers and writers of the ancient Church, who flourished after the time of the apostles and apostolic fathers (the immediate disciples of the apostles), from the 2d to the 6th century. This name is also sometimes given to the teachers and writers of the following centuries, down to the schoolmen, who begin with the 12th century. A large number of their writings have been preserved, and have been published by modern scholars. The fathers of the Church are divided into two chief classes—Latin and Greek. The most celebrated among the Greek fathers are Clement of Alexandria, Origen, Eusebius, Athanasius, and Chrysostom. The most distinguished among the Latin fathers are Tertullian, Augustine, Ambrose, and Jerome.

Church of God, an American Christian sect which originated in Harrisburg, Pa., 1830, in a movement in which John Winebrenner, previously a minister in the German Reformed Church, was most prominent. A new society was

organized by him, and others who accepted his views, which took the name of the Church of God. It exists principally in Pennsylvania and the Western States. The government of the Church of God is Congregational, with a supervising Church Council, composed of the preachers in charge, the elders, and deacons. Associations, or conferences of Churches, called Elderships, meet annually, and a General Eldership meets every three years. The church holds the doctrines of the Evangelical churches, with baptism by immersion only, subsequent to faith; it practices feet-washing; the administration of the Lord's Supper in the evening; all the instrumentalities of revivals. In 1900 there were 460 ministers, 580 church edifices, and 38,000 communicants. The church property was valued in the same year at about \$750,000. The denomination publishes several newspapers, and sustains a college at Findlay, Ohio. (See WINEBRENNER.) Consult: Bardenhemer, 'Manual of Patrology' (2d ed., trans. by Rev. T. J. Shahan, 1905); Schmid, 'Manual of Patrology' (5th ed., 1903).

Church of God in Christ, a recognized body of Mennonites, one of the 12 sects in the United States, about 500 in number. See MENNONITES.

Church Government, the regulation and ordering of spiritual matters, or those pertaining to the discipline and work of the Church. Four leading views are at present entertained regarding church government. The first three agree that the rudiments of a scheme of church government are laid down in the New Testament. They differ, however, as to what that scheme is, much the greater number believing it to be Episcopacy, though one large minority are in favor of Presbyterianism, and another in favor of Congregationalism. The fourth view, which has not a large number of advocates, is that no scheme of government was laid down in the New Testament, applicable to all times and places, but that the church has the power of adapting its government to the special circumstances in which it finds itself at any particular time. See CHURCH, AN ORGANIZATION OF CHRISTIANS.

Church of the New Jerusalem, the name taken by a body of Christians who base their belief on the teachings of Emanuel Swedenborg. This sect was founded in 1787, 12 years after the death of Swedenborg, by 15 of his ardent disciples. The founders of the church claim that Swedenborg had a special revelation which authorized him to teach,—as real a command to go forth as was given to the apostles. The system of Christian Doctrine held by this church differs in distinctive points from that held by other Christian churches. They believe of God that he is the creator of all things, that Jesus Christ is God, and that God is all truth, all beauty, all good. The Scriptures are held to be revelations from God through man; and the teachings regarding the future life, are direct revelations from persons of the other world to Swedenborg himself.

The church was established first in England, then the United States, Canada, and in a few places in other parts of the world. In the United States and Canada there are 107 societies, 95 ministers, and about 6,500 members. The active members of the church claim that in

CHURCH HISTORY — CHURCH, STATES OF THE

the United States and Canada there are altogether about 12,000 believers. For a fuller account see **NEW JERUSALEM CHURCH**; see also **SWEDENBORG, EMANUEL**.

Church History, the history of any church, but especially of the Christian Church. Church history naturally divides itself into four periods: From the advent of Christ to the time of Constantine; from Constantine to Mohammed, or by the arrangement of Mosheim and others, to Charlemagne; from Mohammed, or alternately from Charlemagne to the Reformation; from the Reformation to the present time. This division of the subject is not always followed; some authors regard the great periods in Church history, as: Foundation, Persecution; Extension; Reformation. See **CHRISTIAN CHURCH, THE**.

Church-rate, in England, a rate raised for the purpose of repairing and sustaining the church, churchyard, and for similar objects. It was made by the churchwardens with consent of the parishioners, who fixed the amount, but could not refuse it altogether, as in that event the churchwardens were empowered to levy a rate for necessary purposes. The rate, though applicable for repairs to parish churches only, was requirable from parishioners of all religious denominations. This often gave rise to complaints, and these led to repeated proposals for its commutation or entire abolition. This last, so far as the rate was compulsory, was effected in 1868.

Church, States of the, the Pope's dominions in Italy. They arose with the grant of Pepin, king of the Franks, in 754, who bestowed on Pope Stephen II. some districts which the Lombards, against whom Stephen II. solicited Pepin's assistance, had taken from the Exarchate of Ravenna. Charlemagne confirmed this grant in 774, and in return received the title of Roman Emperor from Leo III. in 800. The wise policy of the Popes in conferring favors on the Normans in Lower Italy secured to them in these vassals staunch protectors of the holy see. The structure of the papal power was fully completed in 1075 under Gregory VII. The dominions of Matilda of Tuscany were added to the states of the Church by her request, and the Popes maintained possession of them against all the claims of the German emperors. The papacy removed a dangerous neighbor belonging to the house of Hohenstaufen by raising the house of Anjou to the throne of Naples in the year 1265. The frequent revolutions of the Romans and the influence of the French led the Popes of the 14th century to transfer their residence, from 1305 till 1376, to Avignon, which Clement VI. bought of Joanna, queen of Naples and countess of Provence, in 1348. As this change of residence was made, it was charged under the influence of the king of France, it never obtained the full assent of the Romans and Germans, and anti-popes were sometimes elected by the opposing factions, and the welfare of the Church as well as of the state suffered by their mutual hostilities. After 20 years of exile the Popes returned to Rome. Julius II. added Bologna to the papal dominions in 1513, and Ancona in 1532. The Venetians were obliged to restore Ravenna. Ferrara was also recovered from Modena in 1598, and Urbino was bequeathed to the papal chair in 1626 by its

last duke, Francis Maria, of the house of Rovera. The wise administration of Sextus V. restored internal order toward the end of the 16th century; but the extravagance and family partialities of some of his successors created fresh disorder. Subsequently Naples renounced her feudal obligations to the papal chair. After the successes of the French in Italy the Pope was forced at the Peace of Tolentino, 13 Feb. 1797, to cede Avignon to France, and Romagna, Bologna, and Ferrara to the Cisalpine republic. An insurrection in Rome against the French, 28 Dec. 1797, caused the annexation of the states of the Church to the Roman republic. Pius VI. died in France. The victories of the Russians and Austrians in Italy favored the election of Pope Pius VII., 14 March 1800, who, under the protection of Austrian troops, took possession of Rome. By the concordat concluded in 1801 with the First Consul of the French republic the Pope again lost a great part of his temporal dominions. In 1807 France again declared war, and the provinces of Ancona, Urbino, Macerata, and Camerino were added to the kingdom of Italy. The possessions of the Church beyond the Apennines were all that remained to the Pope. On 2 Feb. 1808, a French corps of 8,000 men entered Rome; the remainder of the papal states were added to France, and a pension of 2,000,000 francs settled on the Pope, whose ecclesiastical power was guaranteed by Napoleon. The decree of 17 May 1809 put an end for the time being to the ecclesiastical state. The Pope was held a prisoner in France until the events of 1814 again permitted him to take possession of his states. Pius VII. was succeeded by Leo XII., who reigned from 1823 till 1829. He was succeeded by Pius VIII., who, in his turn, was succeeded by Pius IX. in 1846. The first acts of this Pope were characterized by such a liberal spirit that diplomatic Europe was surprised. The events of 1848 caused the Pope to pause in his advanced policy, which so dissatisfied the extreme liberal party that they drove Pius IX. from Rome, and the reins of government fell into the hands of Garibaldi, Mazzini, and Avezzano (1849). Some few months afterward the French government, resolving to restore the papal authority, sent Gen. Oudinot with an army against Rome. Defeated in their first attack on the city, the French began a siege in regular form, and in a month's time were masters of it. Pope Pius did not return to Rome, however, until the following year.

After the Austro-Italian war of 1859 the papal see was stripped of the greatest part of its territorial possessions. Embracing before that date an area of 17,218 square miles, with 3,124,668 inhabitants, the Roman territory was then reduced to 4,891 square miles, and 692,106 inhabitants. Of the former legations and delegations into which it was subdivided only five remained, namely — Rome and the Comarca, Viterbo, Civita Vecchia, Velletri, and Frosinone. From 1860 to 1866 the papal government was sustained by the presence of a French army, which was withdrawn in 1866 upon the King of Italy binding himself by treaty to respect the integrity of the Roman states. In 1867, however, revolutionists numbering 15,000, belonging to the Italian party of action, entered the papal territory, headed by Menotti Garibaldi. They made but

CHURCH TEMPERANCE SOCIETY — CHURCHING OF WOMEN

little progress until the elder Garibaldi placed himself at their head. Napoleon III., at the earnest prayer of the Pope, sent an army to protect the city against the violence of the revolutionists, who had now surrounded it. On 28 October the French entered Rome, and Garibaldi, beginning to perceive that he would be hemmed in by the regular Italian forces under Cialdini, thought of retreating. An advanced section of the papal troops came in contact with the Garibaldians (3 November), and were likely to have suffered severely had not two French battalions, armed with the Chassepot rifle, come speedily to their aid. Garibaldi, with 4,000 men, retreated into the Italian territory, where they were disarmed. A strong force of French troops were left in occupation of Civita Vecchia after peace was restored, and the Pope seemed as secure as ever. But the outbreak of the Franco-German war changed the aspect of affairs. The French army of occupation left Rome on 30 July 1870, and the Pope was at the mercy of his powerful neighbor, Victor Emmanuel, king of Italy, who, seizing the opportunity, marched upon Rome and took it by force of arms. In September the Italian troops occupied Rome. In October the states of the Church were incorporated with the kingdom of Italy, a plebiscite was held under bayonet-rule, the count of which resulted in 133,681 in favor of the Sardinian occupation and 1,807 against it. In the beginning of July 1871, Rome became the seat of the Italian government and the residence of the court.

Church Temperance Society, a national organization of the Anglican Church in the United States. It was founded in New York in the year 1881, and its object is to promote temperance by means of high license. It seeks to influence state legislators and municipal authorities, and it has done most effective work in providing substitutes for the saloon. The organization in the United States follows, in a measure, the methods used for several years by the Church of England Temperance Society.

Churchwarden, one of two Episcopalian parochial officers chosen annually at the Easter vestries. In Anglican Churches in the United States the wardens are usually elected by the parishes; in England the custom prevails of the rector appointing one warden and the parish the other. Their duties are to protect the building of the church and its appurtenances, to superintend the ceremonies of divine worship, and the proper distribution of alms, etc.; to form and execute parochial regulations, and generally to act as the legal representatives of the parish. They usually attend to the secular affairs of the parish.

The term "churchwarden" is also given to a long-stemmed clay tobacco-pipe much used in Great Britain. A famous "make" of this class of pipes is located in the town of Broseley, in Shropshire.

Church'ill, Charles, English satirical poet: b. Westminster, February 1731; d. Boulogne, France, 4 Nov. 1764. He took orders in the Established Church, but reflected very little credit upon his clerical profession. He won his fame with 'The Rosciad,' a satire upon the actors of the time, in which only Garrick and some few popular actresses are praised. His

capacity for ridicule was so great that 'The Ghost,' 'The Farewell,' 'The Conference,' 'The Author,' and 'The Prophecy of Famine,' proved exceedingly popular. He is almost without a peer in his special field.

Churchill, John, Duke of Marlborough. See MARLBOROUGH.

Churchill, Randolph Henry Spencer, LORD, English statesman, third son of the 7th Duke of Marlborough: b. 13 Feb. 1849; d. London 24 Jan. 1895. He was educated at Merton College, Oxford, and having entered Parliament in 1874 as member for Woodstock, by 1884 he had risen to the position of a recognized leader of the Conservative party, and in 1885 became Indian secretary in Lord Salisbury's government. His tenure of this office was rendered notable by the annexation of Upper Burma. On the defeat of Gladstone's Irish bill in 1886 Churchill became leader of the House of Commons and Chancellor of the Exchequer, posts which he unexpectedly resigned in December 1886. He was a brilliant though at times rather violent personality in British politics. His opinions were mainly Conservative, but he often found himself in opposition to the official leaders of that party; and for some time he acted as the leader of what was known as the Fourth Party, consisting of four members who adopted a somewhat independent position. He married in 1874 Jennie Jerome, a daughter of Leonard Jerome, of New York. In July 1900, Lady Randolph Churchill married George Cornwallis West.

Churchill, Winston, American novelist: b. St. Louis, Mo., 10 Nov. 1871. He was graduated from the United States Naval Academy in 1894, and became an editor of the 'Army and Navy Journal' the same year. After serving as managing editor of the 'Cosmopolitan' magazine, he turned his attention to fiction. He has written: 'The Celebrity' (1898); 'Richard Carvel' (1899); 'The Crisis' (1901); 'Mr. Keegan's Elopement'; 'The Crossing' (1904).

Churchill, Winston Leonard Spencer, English soldier and author: b. 30 Nov. 1874. He was educated at Harrow and Sandhurst Military College. He served with the Spanish forces in Cuba, and in the English army during a part of the Boer war 1899-1900. In 1905 he became Under Secretary for the colonies and in 1907 privy councillor. He has published 'The Story of the Malakand Field Force' (1898); 'The River War' (1899); 'Savrola' (1900); 'London to Ladysmith, via Pretoria' (1900); 'Ian Hamilton's March' (1900.)

Churchill River, a river of the Northwest Territories of Canada, which rises in La Crosse Lake, forms or passes through various lakes or lake-like expansions, the largest being Big or Indian Lake, and enters Hudson Bay near Fort Churchill, after a northeasterly course of about 800 miles. It is called also Missinnippi, English and Beaver. Except by means of frequent portage, it is not navigable.

Churching of Women, a rite founded on the Mosaic injunction found in Levit. xii. 6-8, and as practised in some denominations, is now a giving of thanks for the birth of a child. The first mention of the subject as a usage in the Christian Church is found in the pseudo-nicene Arabic Canon, but no prescribed form is given.

CHURCHUS — CHURUBUSCO

In the Greek Church the presentation of the child is made on the 40th day after birth, according to Luke ii. 22. The Roman Catholic Church imposes no obligation upon its members in this respect, but recommends it as a laudable and pious custom. The form is prescribed by the Roman Catholic ritual. The priest sprinkles with holy water the woman who kneels at the altar-railing and holds a lighted candle, and having recited the 23d Psalm, he puts the end of his stole into her hand and says: "Come into the temple of God; adore the Son of the Blessed Virgin Mary, who has given thee fruitfulness in child-bearing." The priest then says a prayer of thanksgiving, blesses her, and sprinkles her with holy water in the form of a cross. The rubric of the Roman Catholic ritual reserves this rite for women who have children born in wedlock. The Anglican Church provides in the prayer book a prescribed form for the ceremony. The Congregational, Presbyterian and other churches either ignore, or declare that there is no scriptural warrant for the rite.

Churchus, a deity worshipped by the ancient Prussians. It presided over food and drink.

Churl, *chērl* (Saxon *ceorl*) in modern usage, a rude, boorish person, but in Saxon England, the term denoted a common freeman. The rank of the churl, or *ceorl*, steadily declined until finally the only important distinction between churl and serf was that the former might choose his own master. The better class of churls sometimes found their way into the class of *theyns*, or *thanes*, corresponding to the knights of post-Conquest times, while the others became the villains of the Norman feudal organization. 'Domesday Book' makes no mention of the word *ceorl*.

Churn, a vessel in which cream is agitated to separate its buttery globules in a solid mass from the fluid portions. The length of time usually occupied by this process, and the fatigue consequent upon working those machines by hand, have caused the ingenious to produce numerous modifications in form and size. Some may be worked by dogs in the way a squirrel-wheel is driven; others may be worked by horse-power; and in some cases steam is the motive power. The ordinary plunge-churn, with its cylindrical box, its straight rod projecting downward through the cover and attached below to the dasher, has been greatly improved by an arrangement by which the air is introduced into the cylinder at every stroke by a tube run right along the handle, with a valve at its end which opens as the dasher rises and closes as it sinks. The air is thus dashed through the cream, separating it into innumerable small particles, and throwing it into a state of foam. A box form of churn, with dashers attached to a rod passing horizontally through the box, and driven by a winch, is frequently used. Less common kinds are those in which the whole body of the machine is set in motion, such as the rocking-churn and the barrel-churn. A churn on the centrifugal principle has been introduced into Sweden. Though the rapid completion of the process of butter-making is the principal end in view, it is a well-known fact that butter suffers seriously by too rapid a process. When butter forms in about 45 minutes it is sure to be good; when it appears sooner it is soft; when later, strong-tasted. See BUTTER; DAIRY.

Churrus, *chūr'rūs*, the resinous exudation of the leaves and flowers of Indian hemp, *Cannabis indica*. It is used by the natives of India as an intoxicating drug. According to Jaffur Shurreef, a man covers himself with a blanket and runs through a field of hemp early in the morning; the dew and gum of the plant naturally adhering to it are first scraped off and the blanket afterward washed and wrung. Both products are boiled together and an electuary formed. The smoking of five grains of it will produce intoxication.

Churubusco, *choo-roo-boos'kō*, **Battle of**, one of the principal engagements of the Mexican war, took place 20 Aug. 1847. Contreras (q.v.) was won in the early morning, Churubusco in the forenoon and early afternoon, of that day, but they are quite distinct battles. The main road north to the city of Mexico, via San Augustin and San Antonio, an elevated paved causeway, converges with that on the west from Contreras and Coyoacan at Churubusco, a village six miles south of the capital and a mile northeast of Coyoacan. Just north of it runs east and west the little stream called Rio Churubusco, crossed by the main road at a bridge fortified with a bridge-head; there was a strong bastion 75 to 100 yards on a side, with embrasures sweeping the San Antonio road. Along the sides were cornfields, maguey plantations, hedges and thickets, and irrigating ditches full of water. In the western part of the village, southwest of the bridge-head, on the Coyoacan road, was the Convent of San Pablo, a massive building with walls so thick that field-pieces could make no impression on them, defended on two sides by strongly built bastions with six or eight heavy guns, and the building itself an impregnable cover for musket-fire. Around it was a flooded moat, in front were cornfields and thickets. The two points to be carried were the convent and the bridge-head; and since, after the rout at Contreras, this was the last place where the Mexicans could make a stand short of the city of Mexico, the resistance was likely to be desperate. The wreckage of Contreras was being pursued by Pillow and Twiggs along the Coyoacan road; and Worth, having turned the works at San Antonio on the main road, had captured a considerable body of the enemy, and was advancing along the causeway. Santa Anna threw a battalion into the convent, placed five guns and a heavy body of troops at the bridge-head, and posted several regiments along the north bank of the stream. The first assault was made on the convent. Bennet Riley's and Persifor F. Smith's brigades, Dimick's and Taylor's batteries, attacking it from the west and south, were received with a storm of shot and shell from the guns in embrasures and barrette; and as they struggled out of the cover they were swept by the musket-fire from the building itself, with heavy loss. Seizing a line of adobe buildings 60 yards from the convent, they opened fire under that protection and held it till the time for advance. Meantime Worth's division, with Pillow, Cadwalader, Garland, Clarke, and others, had charged down the causeway, blocked for several hundred yards with loaded wagons, and through the fields to the bridge-head. Broken into irregular fragments by the hedges and ditches, they were twice repulsed with tremendous loss by the

CHUSAN ARCHIPELAGO — CIAMPI

plunging fire of the Mexican guns; but Shields had moved north from Coyoacan and, after a fierce combat, which nearly overwhelmed him, he was reinforced by Lee and Sumner, carried the river line, and moved east against the rear of the bridge. In danger of having their retreat from the capital cut off, the Mexicans lost nerve, and a third charge from the Americans carried the head with a rush. Thence they turned southwest against the convent; the American artillery was still battering it on the other side; a sally from the garrison was driven back and, as the fire slackened, both divisions of the Americans entered it from opposite sides at the same time. The American forces in this battle numbered a little over 7,300; the Mexican numbers are uncertain, but probably about 25,000. The American losses at Contreras and Churubusco together were 1,053, not over 100 at Contreras. The Mexican loss was 2,637 prisoners at both, and probably 2,000 at least killed and wounded at Churubusco. Consult Wilcox, 'History of the Mexican War' (1892.)

Chusan (choo'san) **Archipelago**, a group of islands off the east coast of China, the largest being the island of the same name, which is about 21 miles long, and from 6 to 11 broad, with a population of about 200,000. Its surface is finely diversified by hill and dale. The rocks are evidently volcanic; and the soil, often very fertile, is under good cultivation, for the most part by spade husbandry. On the same slope may be seen, in different stages of their growth, wheat, tea, sweet potatoes, cotton, and tobacco. There are several towns on the island; the capital is Ting-hae, a walled town of about two miles in circumference. From its situation near the mouths of the Yang-tse-kiang, which forms the great channel of communication with the heart of the empire, Chusan is considered as the key of southern China, and was accordingly taken possession of by the British on two occasions during the first Chinese war. Notwithstanding the great mortality among the British troops during their occupation of the island, the climate is still considered healthy.

Chutia Nagpur, choo'tē-ā nāg-poor'. See CHOTA NAGPUR.

Chutney, chūt'nī, a condiment compounded of sweets and acids, much used in the East Indies, and thence introduced into England and the United States. Ripe fruit, raisins, spices, herbs, chillies or cayenne, lemon-juice, vinegar, etc., are the ordinary components, which are pounded, well boiled together, and then bottled for use. It is much eaten in India with curries, stews, etc.

Chuz'zlewit, Martin, the principal character in Charles Dickens' novel of that name.

Chyle, kīl, the liquid mixture of food-stuffs taken up by the lacteals from the intestine in the course of digestion. It is not a definite substance, its composition varying very widely according to the character of the ingested food. See DIGESTION; LACTEALS.

Chyme, kīm, a pulpy mass into which food in the stomach is resolved by the action of the gastric juice and by the contraction of the stomach. This mass is grayish in color, and the previous texture or nature of the aliment can be no longer distinguished. It passes by the

pylorus into the intestinal canal, where it is mixed with the pancreatic juice and the bile. The thinner parts of it are absorbed by the slender tubes termed "lacteals." The liquor thus absorbed, which is called "chyle," (q.v.), is of a white color; it passes through the glands of the mesentery, then enters the thoracic duct, and is conveyed by it into the blood at the junction of the left jugular with the left subclavian vein. Chyle is an opaque milky fluid, mild to the taste. By standing for some time one part of it coagulates, another portion is coagulated by heat. The chyle, after mixing with the lymph conveyed by the absorbent vessels, is received into the blood, which has returned from the extreme vessels before this passes to the heart. All traces of it are very soon lost in the blood, as it mixes perfectly with that fluid. It is probable, however, that its nature is not immediately completely altered. The blood passing from the heart is conveyed to the lungs, where it circulates over a very extensive surface presented to the atmospheric air, with the intervention of a very thin membrane, which does not prevent their mutual action. During this circulation the blood loses a considerable quantity of carbon, part of which, it is probable, is derived from the imperfectly assimilated chyle, as this, originating in part from vegetable matter, must contain carbon in larger proportion than even the blood itself. See DIGESTION; LYMPH; NUTRITION.

Cialdini, Enrico, ěn-rē'kō chāl-dē'nē, Italian military officer: b. Castelvetro, Modena, 10 Aug. 1811; d. Leghorn 9 Sept. 1892. By his share in the insurrection of 1831 was forced to escape to France, and in 1835 passing over to the Spanish service, he fought against the Carlists and was made colonel. When Charles Albert headed the Italian rising in 1848, he was employed by the Sardinian government to reduce the volunteers to discipline, and fought at the head of his new regiment in the brief campaign of 1849. In the Crimea he commanded a division of the Sardinian contingent; and on his return was appointed aide-de-camp to the king. He was intrusted by Cavour with the formation of the famous Cacciatori delle Alpi. In the war of 1859 the victory at Palestro was his chief exploit. In 1860 he defeated the papal army at Castelfidardo; in 1861 Gaeta and Messina yielded to him. Created Duke of Gaeta, and for a few months governor of Naples, he had to act against Garibaldi in the second Sicilian expedition (1862). In 1864 he became a senator; and in the war of 1866 occupied Venice almost without a blow. In 1876 he was sent as ambassador to Paris, but he retired in 1881, and received the post of one of the two generals of the army.

Ciampi, chām'pē, Ignazio, Italian poet and historian: b. Rome 1824; d. 1880. From 1874 till his death he was professor of modern history in the University of Rome. Among his poetical works are some imitations of the Russian Pushkin; an epic, 'Stella'; and two volumes of 'Various Poems.' He wrote several works on the history of literature, also biographies and histories of special periods. His principal work appeared posthumously: 'Modern History,' from 1492 to the Peace of Westphalia.

Ciampi, Sebastiano, Italian scholar: b. Pistoia 30 Oct. 1769; d. Florence 14 Dec. 1847.

Ordained as a priest in 1793, he was appointed professor at the University of Pisa in 1803; owing to some misunderstanding with his colleagues, he accepted in 1818 a professorship at Warsaw, and returned to Italy in 1822, a prebend having been conferred on him in Poland, which enabled him to devote himself to literary studies at Florence. His principal works treat of Italian literature and art, of ancient literature, of the Latin literature of the Middle Ages, and of the history of Poland.

Ciampoli, Domenico, dō-mā'nē-kō chām-pō'lē, Italian novelist: b. Atezza in Abruzzi 25 Aug. 1855. His stories and romances are to a great extent pictures of life among the peasantry and mountain folk of southern Italy. He has also written romances of a less local character: 'Diana'; 'The Unknown.' He has devoted special study to Slavic literature, and published several volumes on that subject.

Cibao, se-bā'ō, a mountain range in the central part of Santo Domingo; length about 20 miles. When Columbus discovered the island, he was told by the natives that there was gold in the Cibao and he thought it to be a part of Japan. Gold was found there in 1494, by Ojeda.

Cibber, sīb'bēr, Caius Gabriel, Danish sculptor: b. Flensburg, Holstein, 1630; d. London 1700. He visited England during the protectorate of Cromwell, and met with such encouragement as to induce him to settle there. He was employed to execute the bas-reliefs on the pedestal of the London Monument. The work, however, by which he is principally known are his figures of Raving and Melancholy Madness, formerly erected above the gate of the old Bethlehem Hospital, and now in the new hospital, St. George's Fields. He was the father of Colley Cibber (q.v.)

Cibber, Colley, English dramatist and actor: b. London 6 Nov. 1671; d. there 12 Dec. 1757. He was a son of C. G. Cibber (q.v.) and the sculptor's second wife, Jane Colley. He made his appearance at Drury Lane Theatre in 1689. In 1695 appeared his first comedy, 'Love's Last Shift,' which met with great success. In this piece he played the part of Novelty, a fashionable fop. This character is found in most of his pieces, and in the representation of it he was likewise distinguished. His dramatic celebrity is founded chiefly on the 'Careless Husband,' which even obtained the approbation of his declared enemy, Pope. This piece, though without novelty in the characters, and without invention in the plot, is a good picture of the manners and follies of the time. His comedy, the 'Non-juror,' an imitation of Molière's 'Tartufe,' adapted to English manners, appeared in 1717, and was directed against the Jacobites. It was very successful, but drew upon him many enemies, whose number he increased by his conduct as director of Drury Lane Theatre, from 1711. His appointment as poet-laureate in 1730 gave full play to the railery of his enemies. Cibber had the good sense to join in the laugh against his own verses. Pope, however, did not cease to ridicule him on every opportunity. Besides writing original works for the stage, he adapted a great number of others, the acted Richard III. being one of those that have passed through his hands. In 1750 he quitted the theatre, and published the

'Apology for the Life of Colley Cibber,' written with spirit and candor, and containing many entertaining anecdotes and judicious remarks.

Cibber, Susannah Maria (ARNE), English actress: b. London February 1714; d. there 30 Jan. 1766. She was the sister of the celebrated Thomas Arne (composer of 'Rule Britannia'), who taught her music, and introduced her in one of his operas at the Haymarket Theatre. She was so much of a favorite with Handel, that he composed pieces expressly adapted to her voice, and used to instruct her in singing them. In 1734 she married Theophilus Cibber (q.v.), but was soon after separated from him. She subsequently made her appearance in tragedy. Her beauty and her talents gained her universal admiration. Garrick is said to have exclaimed when informed that she was dead, "Then tragedy has expired with her." She is buried in Westminster Abbey.

Cibber, Theophilus, English actor and dramatist: b. 26 Nov. 1703; d. Oct. 1758. He was the son of Colley Cibber (q.v.). Among his plays are: 'The Lover' (1730); 'Patie and Peggy' (1730); 'The Auction.' The 'Biography of English and Irish Poets,' which appeared under his name, was from the pen of Robert Shiels, a Scotsman, who purchased for 10 guineas the right of prefixing to the work the name of Cibber, then in prison for debt.

Cibol, sīb'ōl, a perennial plant (*Allium fistulosum*) of the onion genus, a native of Siberia, with hollow stems larger than those of the chive. It was formerly cultivated in Great Britain for culinary use, but it has been superseded by more palatable species. See ONION.

Ciborium, sī-bō'rī-um, the sacred vessel, of silver or gold or silver-gilt, and often incrustated with precious stones, in which the sacred host is reserved. Its liturgical name is pyx. In the language of architecture, ciborium is the name of the canopy which overhangs the high altar of a church.

Cibrario, Luigi, loo-ē'jē chē-brā'rē-ō, Italian historian and politician: b. Turin 23 Feb. 1802; d. Salo 1 Oct. 1870. He studied law, entered the service of the State, and soon distinguished himself by his historical investigations. In 1848, when Italy rose against the Austrians, Charles Albert appointed him commissioner at Venice and a senator of Sardinia. In 1852 he was made minister of public instruction, and ultimately, in 1855, minister of foreign affairs. In 1839 he published his 'Della Economia Politica del Medio Evo'; in 1840, his 'Storia della Monarchia di Savoia'; and in 1847, his 'Storia di Torino.' He published numerous other works on history, numismatics, and miscellaneous subjects.

Cicacole, sīk-ā-kōl'. See CHICACOLE.

Cicada, sī-kā'da, a large insect of the order *Hemiptera*, sub-order *Homoptera*, and family *Cicadidæ*, known by its broad head, protuberant eyes, sucking beak, and a well-developed ovipositor. The male cicada makes a shrill noise by means of a special apparatus at the base of the abdomen or hind-body. The loud, piercing notes issue from a pair of structures or cavities on the under side of the body, which act somewhat as two kettle-drums or "timbals," each cavity being covered by a tense membrane which is rapidly vibrated by means of two special mus-

CICATRIZATION — CICERO

cles within. The sound is variously modified by adjacent smaller disk-like sounding-boards, which increase and transmit the sound vibrations caused by the movement of the membrane. The sound is modified by the semicircular disks, one on each side projecting from the metathorax over the "mirrors," cover-plates, or sounding-boards, one on each side, and which, when closed, deaden the sound, or, if open, allow it to escape in greater volume. This apparatus appears to be homologous with the "ears" of the locusts or common grasshoppers. Cicadae have an incomplete metamorphosis, the young (nymphs) being like the parents, but without wings; they live attached by their beaks to the roots of trees, etc. The female deposits her long, slender, cylindrical eggs in gashes in twigs made by her saw-like ovipositor. From 400 to 600 eggs are laid, the process requiring about 45 minutes. The 17-year cicada (wrongly called 17-year locust) is the longest-lived of any known insect, as the grub or nymph lives for over 16 years sucking the roots of forest trees, often several feet below the surface; in the late spring it finishes its transformations, and usually at the last of May or the beginning of June, issues in enormous numbers from the ground. This appearance of a 17-year brood in a given area has been recorded as far back as 1633. At the present time each year has its brood or broods, each limited, as a rule, to a well-defined district. Of such broods there are 30, occurring over a large area in the Atlantic and Central States. In southern New England a brood periodically appears near Fall River and on Martha's Vineyard, as well as in Connecticut, while in Rhode Island its first appearance known in history was in the first week in June 1903, in the town of Coventry, near Tiogue reservoir. The southern limits are northern Georgia and the western limits are eastern Nebraska and Kansas. Besides this 17-year brood there is a 13-year brood, which is more southern, the dividing line being about latitude 38°; this appears to be a temperate variety. The male is very short-lived and takes no food. The females live for several weeks and deposit their eggs about the middle of June in New York and West Virginia. The young hatch, dropping to the ground about six weeks after the eggs are laid; it then burrows into the soil and begins to pierce the rootlets of trees. The nymph molts about once a year or oftener, and Riley estimates the number of molts at from 25 to 30, while there are six stages of growth before the imago or winged state is assumed. Consult: Riley, 'The Periodical Cicada' ('Bulletin 8 U. S. Department of Agriculture'); Marlatt, 'The Periodical Cicada' (Ibid. 14).

Cicatrization, sik''a-trī-zā'shōn, the process of healing in the skin of an ulcer or a wound. Where a solution of continuity of the skin is made the blood is thrown out into the gap, the edges of the wound are gummed together by serum, and, springing from both sides of the wound, new connective tissue is formed. This new connective tissue gradually fills the wound with a white glistening mass, the cicatrix. This contracts, and all that may be left of the wound is a white shiny strip of new connective tissue.

Cicely, Sweet, a plant of the United States belonging to the natural order *Umbellifer*, a

perennial herb growing from fleshy, clustered, thickish roots. There are about 15 species in North America, western South America, and eastern Asia, grouped into the genus *Washingtonia*, so named in honor of George Washington. Eleven of the 15 are natives of the western United States. They are related to chevрил (q.v.) on one side, and to *Scandix* on the other. The smoother sweet cicely (*W. longistylus*) grows in the woods of southern Canada, through Dakota, eastward to North Carolina, southward to Tennessee and Alabama, and westward to Kansas, and on elevations to the height of 4,200 feet. The roots have a rich spicy taste and odor, resembling anise. The sweet cicely of England (*Myrrhis odorata*), although common about buildings, is an imported plant, probably from central Asia. It is fragrant, and its odor is supposed to be particularly agreeable to bees, therefore hives are rubbed with the herb to attract them.

Cicer, sī'sēr, a genus of the natural order *Leguminosæ*, of the tribe *Viciæ*, of which the chick-pea (q.v.) is a representative.

Cicero, Marcus Tullius, Roman orator and public man and the greatest master of Latin prose style.

Cicero was born in 106 B.C. in Arpinum, the birthplace also of Marius. His father was a knight of good social position and the son was well educated in preparation for the bar and for public life. While still a young man he served a campaign under the elder Pompey. He first appeared as a lawyer in 81 and again in 80, and in the latter case was brought into direct collision with a favorite of Sulla, at that time perpetual dictator. It was perhaps in consequence of this that he withdrew for a time from Rome and spent the years 79-77 in Greece and Asia Minor, occupying himself with the further study of oratory. In 75 he began his political career by serving as quæstor in Sicily and in 70 he gave evidence of the closeness of his relation to that province by prosecuting Verres for mal-administration as governor there. In 69 he was Curule Ædile and in 66 Prætor Urbanus, following the usual course of offices; in the latter year he made his first distinctively political speech in support of a proposal by the tribune Manilius to give to Pompey the command of the war against Mithridates. Though the distinction between parties was then less sharp than it is now, he had thus far been connected with the democratic party, but in the canvass for the consulship for 63 that party had already two candidates in the field, Catiline and Antonius, while the Optimates had no candidate of special promise. As Catiline belonged to the radical wing of the democrats, the senatorial party, desiring his defeat, threw its influence in Cicero's favor. He was thus elected as a representative of the Optimates and continued to act with that party during the rest of his life. His constitutional instincts were further strengthened by the outbreak during his consulship (63) of the so-called conspiracy of Catiline, an attempt by the radicals under the leadership of this reckless noble to seize the government by violent means. This attempt Cicero put down with considerable vigor; Catiline was killed in battle and several of his associates were condemned to death by a vote of the senate and executed under Cicero's orders. The

CICERO

execution, however, was of questionable legality, since it set aside the right of the accused to an appeal to the popular assembly, and Cicero was at once attacked by members of the democratic party for his responsibility in the transaction. Upon the formation, in 60, of the coalition between Cæsar, Pompey and Crassus called the First Triumvirate, by which the democrats came into control of the government, Cicero was banished from Rome and left Italy (April 58). The years preceding his exile had been years of great professional activity and some of the best of his speeches belong to this period, but he had not yet acquired the habit of literary production and the year of his absence was unfruitful except in letters. His return to Italy in 57 was made the occasion of a great party demonstration and was to some degree a personal triumph, and he engaged himself at once in suits for the recovery of his property and in the party struggles with the Triumvirate. During this period he also took up again his early studies in rhetoric and wrote the 'De Oratore,' one of his most finished and authoritative works. He had not up to this time followed the usual custom of taking the proconsular governorship of a province, but in 51, in compliance with a new law, though much against his will, he went as governor to Cilicia. He spent here exactly the year required of him, from 31 July 51 to 30 July 50, but impatient as he was of the enforced absence from Rome his governorship was highly creditable to him; he showed, in particular, the most honorable scrupulousness in abstaining from even the customary exactions from the provincials. When he returned to Rome, he found all parties absorbed in the agitations which preceded the civil war. Early in 49 Cæsar marched upon Rome and Pompey withdrew to Dyrrachium. During these months Cicero remained away from the city in great uncertainty as to his duty and his interests. Cæsar asked of him only that he should remain neutral, and his own forebodings as to the outcome of the struggle inclined him toward this course, but his party connections, his constitutional prejudices and opinions and his lifelong respect for Pompey took him finally to the camp at Dyrrachium. After the victory of Cæsar at Pharsalus in August 48, he returned to Italy and spent a year in Brundisium, awaiting Cæsar's permission to go to Rome. From the summer of 47 to March 44 the domination of Cæsar put an end to free discussion and action in the state and Cicero made only a few speeches, addressed to Cæsar, with whom he had always been on terms of friendship, on behalf of persons desiring amnesty. But the enforced political inactivity he put to use in literature and to this period belong almost all his greatest writings, the ripe fruits of a life of intellectual interests. In March 44 the assassination of Cæsar aroused in Cicero, though he was not cognizant of the plot, a renewed hope that the senate might recover control of the state. But for the first few months events turned against his party; popular feeling did not approve the death of Cæsar, Antony was unexpectedly active and successful, and Cicero for a time thought of joining Brutus and Cassius in the East. As the confusion began to clear, however, and the old issue between constitutional government and the rule of a dictator took form, Cicero's indecision came to

an end and he threw himself unreservedly into the contest of the senate with Antony. The 14 Philippics, delivered between September 44 and March 43 are unmatched among his speeches. When Antony and Octavianus (the later Augustus) were reconciled and formed with Lepidus the Second Triumvirate, Cicero's name was placed upon the list of the proscribed and he was killed at his villa near Formiæ, 7 Dec. 43.

The literary work of Cicero is in amount much greater than the extant work of any other Latin writer and in value is second only to the poems of Vergil. It consists of orations, rhetorical works, philosophical essays and collections of letters, and will be taken up in that order.

Of the orations we possess 57 in nearly complete form and the titles of some fifty more are known. The extant orations are about equally divided between speeches to the senate or the people on public questions and legal pleas. Cicero spoke by preference on the side of the defence in both civil and criminal trials, sometimes making a close legal argument, but not infrequently using also political and even literary discussions to relieve the formal argument. The public orations are to a considerable extent invectives, especially the four orations against Catiline and the 14 Philippics against Antony, and these are at times bitter to a degree that modern taste would condemn, even in the most excited political struggles. But the wit, the fire, the humor and breadth, the easy handling of complex argument and the perfection of stylistic form are such that no critic, either ancient or modern, has seriously questioned Cicero's supremacy in Roman oratory.

The rhetorical works deal chiefly with oratory; several are text-books on the theory and practice of public speaking, one is a history of Roman oratory and one is a discussion of the ideal in oratory. While Cicero did not attempt a wholly novel treatment of these subjects, there is in the works much of the ripe judgment of the practised speaker who was interested also in the theory of his life work, and they contain some of his most finished and delightful writing.

The philosophical works are constitutional and ethical essays in dialogue form. Cicero himself regarded them as useful means of making educated Romans better acquainted with Greek philosophy, especially of the Academic and Stoic schools, and made for them no claim to originality of thought.

We possess also a collection of nearly 800 letters by Cicero, with nearly 100 more from his correspondents. They begin with the year 68 and with some breaks continue down to the year of his death. About half of them are addressed to his intimate friend, T. Pomponius Atticus, the rest to various persons, including almost all the eminent men of his time. Some few of them are formal and guarded in expression, but the majority, especially those addressed to Atticus, are extremely intimate and confidential, written without thought of publication. They give a most interesting picture of the progress of events and changes of opinion during a critical period of Roman history and they also reveal some of the weaknesses of Cicero's character and have furnished the ma-

CICERO — CICUTA

terial upon which the harsher judgments of his conduct have been founded.

The uncertainty of the judgment of posterity—to which appeal is often made as if it were always precise and infallible—was never better illustrated than in the history of opinion in regard to Cicero. During the earlier centuries after the Revival of Learning, when attention was fixed upon correct and elegant Latinity, the judgment which scholars formed in regard to Cicero's public career was really determined by their just admiration for his Latin style. And most scholars up to the beginning of the 19th century continued to occupy the uncritical position. But with the rise of historical science a revision of opinion was inevitable. This found expression in Drumann's history of Rome and later in Mommsen's history; in both of these writers, however, the extravagant and passionate discrediting of Cicero was as marked as the earlier unquestioning worship had been. The influence of Mommsen's authority is still to be seen in popular and school histories, though scholars have long understood its inaccuracy. But though opinion varies within narrower limits, it still varies somewhat, for reasons which are to be found partly in the character of Cicero and partly in the nature of the constitutional and political questions that are connected with his career. Cicero was, as most orators are, a man in whose temperament emotion and sensibility were more controlling than intellect or will. Such a man is always liable to the charge of inconsistency and his conduct is certain to show extremes of weakness and of strength. On three occasions, in the trial of Roscius, in the affair with Catiline and in the struggle with Antony, he showed the hot courage of attack, but in the trial of Milo he failed to exhibit the cool and steady courage required to face mob violence. At the outbreak of the Civil War he hesitated long—not wholly without reason—and after the death of Cæsar his vacillation amounted to weakness, but taken as a whole his public life was a consistent expression of his patriotic feeling. His depression during his exile was great, but not greater than his cheerfulness during the unhappy years preceding 44. His vanity—of which Mommsen makes much—is indeed repellant to our taste, but it was a foible of his race; Cæsar, not in general a vain man, wrote the extraordinary dispatch, *Veni, vidi, vici*, and Horace, certainly a modest man, wrote the *Exegi monumentum*. A character in which an instinctive artistic perception and a trained intelligence are directed by the emotional temperament of the orator is not to be summarized in a formula.

The political situation, also, when an old constitution was giving way to personal rule, is of a kind about which men will always differ; half the discussion in regard to the character of Cicero is fundamentally an expression of opinion or feeling about such constitutional crises. The severest critics of Cicero have been German scholars, eminent indeed, but accustomed to feudal traditions and inexperienced in the workings of a free constitution. The judgment of English scholars, though not unanimous, has been more intelligent.

Literature.—The best edition is C. F. W. Müller's 'Teubner' (Leipsic, 9 vols.), text without commentary. Halm's editions of the ora-

tions have excellent German introductions and notes; the 'Letters' are well edited by Tyrrell (London). There are 'Lives' by Middleton (1741), Forsyth and Anthony Trollope; also 'Cicéron et ses Amis,' by Boissier.

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Cicero, Quintus Tullius, Roman general and brother of Marcus Tullius Cicero (q.v.): b. about 102 B.C.; put to death by the messengers of Antonius 43 B.C. He was prætor in 62 B.C. and governor of Asia 61–58 B.C. In 55 B.C. he was legate to Cæsar, accompanied him to Britain, and in 54 commanded a legion in Gaul. In 51 he was a legate to his brother, Marcus Tullius, in Cilicia, and in the civil war fought with Pompeius against Cæsar, but in 57 made peace with him. He was proscribed by the triumvirs and killed.

Cicerone, sīs-ē-rō'nē, one who, in Italy, and particularly in Rome, shows and explains to strangers curiosities and antiquities; hence, in general, a guide. The talkativeness of such attendants procured them the name *ciceroni*, in jocular allusion to Cicero. This term is falling into disuse, the official designation, *servitore di piazza*, or simply *guida* (guide), being used instead.

Cicisbeo, chē-chēs-bā'ō, a name given since the 17th century in Italy to the professed gallant of a married lady. It was the fashion among the higher ranks in Italy for the husband, from the day of marriage, to associate with his wife in his own house only. In society or places of public amusement she was accompanied by the *cicisbeo*, who even attended at her toilet, to receive her commands for the day. The custom is the more extraordinary, from the natural jealousy of the Italian, who seemed to change his character completely after marriage.

Cicognara, Leopoldo, COUNT DA, Italian antiquarian, diplomatist and writer on art subjects: b. Ferrera 17 Nov. 1767; d. Venice 5 March 1834. He studied at Modena and the Academy of San Luca, and was later appointed ambassador to Turin, and councillor of state. In 1808 he became president of the Academy of Fine Arts in Venice. His most important work was a 'History of Sculpture from the Renaissance of that Art to the Present Century' (3 vols., 1813–18). He also wrote a 'Life of Canova' (1823).

Ciconia, sī-kō'nī-a, the genus of birds to which belongs the common stork, the type genus of the family *Ciconiidae*.

Cicuta, sī-kū'ta, a poisonous genus of umbelliferous plants commonly known as water-hemlock or cowbane. The plant is a dangerous poison, said to be fatal to cattle that eat it. Persons are known to have died from eating the root, which is white and fleshy. It may be the *koneion* (hemlock) of the Greeks, which Socrates and others condemned to death were required to drink. The common or tree hemlock, *Conium maculatum*, a poisonous umbellifer, has a stem from two to four feet high, hollow, striated, and spotted with purple; leaves large, much divided, and fetid when bruised; and with unilateral partial involucre, marks by which

CID — CIDER

the common hemlock is readily distinguished from the water-hemlock, and from any other species of the *Umbelliferae*. It is indigenous in most temperate climates, and is extensively used in medicine, being given internally as a sedative, and applied externally to sores, **ulcers, etc.**, in the form of a poultice or ointment. The Latin *cicuta* was the true hemlock. See **HEMLOCK**; **WATER-HEMLOCK**.

Cid, **El**, *āl thīd* or *ēl sīd*, the popular name of a Spanish national hero, Rodrigo (or Ruy) Diaz: b. Bivar about 1040; d. 1099. Legend and tradition have somewhat obscured the character of the historical Cid, but the main facts of his life are well established by Spanish and Arabic records. He first appears in national history when Sancho, the eldest son of Ferdinand I., and king of Castile, was at war with his brother, Alfonso; at this time he was already known as the *Campcador* (the champion), a name which he won probably by vanquishing in single combat the champion of Sancho of Navarre. In the war with Alfonso Sancho was victorious, and this success was owing to the Cid, to whom he had given the command of his forces. Alfonso was taken prisoner, and it remained only to overcome the obstinate resistance of Zamora, where Sancho's sister, Urraca, ruled. Before the walls of this city Sancho was assassinated, and Alfonso was called to the throne. It is asserted—but the historical evidence here is not complete—that before recognizing Alfonso's authority the Castilian nobles required of him an oath that he had no part in his brother's murder, and that it was the Cid who administered this oath, in 1073. Whatever the facts, Alfonso must have thought it wise to conciliate the good-will of the Castilian grandees until at least his own position became secure, as he gave his cousin Jimena (or Ximena), daughter of the Count of Ovideo, to the Cid in marriage. The marriage contract, dated 1074, is preserved at Burgos. Later the king, taking advantage of a pretext that the Cid had attacked the Moors without obtaining the royal consent, banished him. Old wrongs which the king still remembered probably furnished the real motive. Then began that career of "soldier of fortune," which, idealized by tradition, has made the Cid the perfect cavalier of Spain. He first offered his services to the Christian Count of Barcelona, and, when refused by him, to the Moorish king of Saragossa, who accepted the offer. The Cid remained in Saragossa till 1088, fighting against Moors and Christians alike, and rising to unusual distinction and power. In 1088 the attention of Mostain, the king of Saragossa, was drawn to the city of Valencia, then under the protection of King Alfonso. The Almoravides, a new Moslem sect from northern Africa, defeated Alfonso in battle, and caused him to withdraw his protection from Valencia, and the governor of the city appealed to Saragossa for help. The Cid was sent to the aid of the city in command of an expedition which proved successful, and he established himself in Valencian territory. As the recognized protector of the lawful king, in reality, the suzerain of Valencia, he received a generous tribute; but it is clear that he had already resolved, when opportunity offered, to secure the city for himself. Meanwhile he skilfully held off, now by force, now by ruse, all other competitors, Christian and

Moslem alike: including among these King Alfonso, whose territories he once wasted with fire and sword. As head of an independent army, he made successful forays in all directions; despoiling, levying tribute, garrisoning strongholds, and strengthening his position in every way, and in 1094 finally became master of Valencia itself. He successfully held the city till 1099, when the troops he had sent against the Almoravides were utterly routed, few escaping, and he already enfeebled in health, died, it is said, of grief and shame. His widow held Valencia for two years longer.

The Cid very soon became the favorite hero of popular songs. It is probable that these songs were at first short stories in rude metrical form; and that the epic poems, dating from about 1200, used them as sources. The earliest of the epic poems is 'The Poem of My Cid,' based upon history, but with a large amount of legendary matter. Its date is probably about 1200. It is one of the best of mediæval folk epics, its characters being drawn with clearness and simplicity. Another poem of about the same date, 'The Legend or Chronicle of the Youth of Rodrigo,' is of inferior merit, though not without fine passages. Two centuries and more after these poems we meet with the 'Romances' or 'Ballads of the Cid.' The earliest of these do not in their present form far antedate 1500. These ballads are derived from all sources, but chiefly from the Cid legend, which is here treated in a lyric, and popular tone.

These ballads make Jimena (or Ximena) Gomez the wife of the Cid, and tell the legendary story of her father (Don Gomez), insulting the Cid's father, of the Cid's revenge by killing Don Gomez, of Jimena's pursuit of the Cid demanding justice of King Ferdinand, and the final reconciliation through marriage. De Castro, in his drama, 'The Youth of the Cid,' drew his material from the ballads, but added love and the conflict between affection and the claims of honor in the mind of both Jimena and the Cid. Corneille, based his drama, 'The Cid,' upon that of Castro, using the same plot and the same struggle between love and duty on the part of the hero and heroine. Corneille condensed De Castro's 'The Cid,' gave it dramatic unity, and added greater dignity and nobility to the verse. His drama, when first put on the stage in France (1636), met with immediate success.

Ci'der, the expressed juice of apples; a beverage, the quality of which depends principally on the following particulars: Kind of fruit, condition of the fruit when ground, manner of grinding and pressing, method of producing fermentation, and precautions to be taken against its excess.

The Kind of Fruit.—The characteristics of a good cider apple are a red skin, yellow and often tough and fibrous pulp, astringency, dryness, and ripeness at the cider-making season. When the rind and pulp are green, the cider will always be thin, weak, and colorless; and when these are deeply tinged with yellow, it will, however manufactured, or in whatever soil the fruit may have grown, almost always possess color and either strength or richness. The most certain indications of the ripeness of apples are the fragrance of their smell and their spontaneously dropping from the trees. When they are in this

CIENFUEGOS

state of maturity on a dry day (all the better if the weather is cool and bracing), the limbs may be slightly shaken and partly disburdened of their golden store; thus taking such apples only as are ripe, and leaving the unripe longer on the trees, that they also may acquire due maturity. They must be carefully gathered to avoid bruising, as mold rapidly fixes upon the edges of every wound of a fruit gathered in autumn, and communicates a disgusting flavor to the juice. The only artificial criterion for ascertaining the quality of an apple for cider is the specific gravity of its must, or unfermented juice; or the weight compared with that of water. This indicates with very considerable accuracy the strength of the future cider. Its weight and consequent value are supposed to be increased in the ratio of the increase of saccharine matter. The strongest and most highly flavored cider which has been obtained from the apple was produced from fruit growing on a shallow loam, on a limestone basis. All the writers on the subject seem to agree that calcareous earth should form a component part of the soil of a cider orchard. A dry and somewhat loose soil is preferred.

Condition of the Fruit.—Fruit should be used when it has attained full maturity, and before it begins to decay. Each kind of apple should be manufactured separately, or at least those kinds only should be mixed which ripen about the same time. The longer the fruit remains on the tree without decay or being injured by frost the better, for not only is the perfect maturity of the juice an important consideration, but the colder the weather, short of actual frost, the more quiet and equable will be the fermentation. When gathered the apples should be carefully stored in some shady, cool room, and placed in heaps to undergo a further ripening, and acquire more saccharine matter while losing a considerable quantity of watery juice.

Grinding, etc.—This operation should be deferred till December, if possible. It is absolutely essential that the weather should be cold, even slightly frosty, to counteract the tendency to rapid fermentation. The apples should be reduced by the mill as nearly as possible to a uniform mass, in which the rind and seeds are scarcely discoverable, and the pomace should be exposed to the air. It has been ascertained that, by exposing the reduced pulp to the operation of the atmosphere for a few hours, the specific gravity of the juice increases from 1.064 to 1.078. For fine cider the fruit should be ground and pressed imperfectly, and the pulp then exposed 24 hours to the air, being spread and once or twice turned, to facilitate the absorption of oxygen; it should be then ground again, and the expressed juice added to it before it is again pressed. The best method of grinding the apples is to employ cylindrical rollers placed so near each other as to crush them. They are fed from a hopper above them, from which the apples pass between a pair of fluted or toothed cylinders, by which they are torn and partially crushed before reaching the more perfectly crushing apparatus below. The mass is then powerfully pressed, and the cider is run into casks.

Fermentation.—The vinous fermentation commences and terminates at different periods, according to the condition and quality of the fruit and the state of the weather. The best

thing whereby to judge of the proper moment to draw the liquor from the scum and sediment is the brightness of the liquid which appears after the discharge of fixed air has ceased and a thick crust has collected on the surface. The clear liquor should then be drawn off into another cask. If it remains bright and quiet, nothing more need be done to it till the succeeding spring; but if a scum collects on the surface it must immediately be racked off again, as this would produce bad effects if suffered to sink. Among the precautions used to prevent excessive fermentation is stumming, which is fuming the cask with burning sulphur. This is done by burning a rag impregnated with sulphur in the cask in which the liquid is to be decanted, after it has been partly filled, and rolling it so as to incorporate the liquid with the gas.

Cienfuegos, thē-ān''foo-ā'gōs, **Nicasio Alvarez de**, ä'l'bä-rēth dā, Spanish poet: b. Madrid 14 Dec. 1764; d. Orthez, France, July 1809. He studied at Salamanca at the time when the modern school of Spanish poetry was founded there by Cadalso and Melendez. He attached himself to this school, and in 1798 laid the foundation of his literary fame by the publication of a collection of poems. Shortly after he became editor of the government newspapers, *La Gaceta* and *El Mercurio*, and was appointed to the department of foreign affairs. He was in possession of this office when the war of Independence broke out. Madrid was occupied by the French, and Cienfuegos, having both offended Murat by an article in *La Gaceta* and taken part in the insurrection of May 1808, was brought to trial and condemned to death. At the intercession of some influential friends the sentence was commuted to banishment to France. His tragedy, 'Pitaco,' had procured his admission to the Spanish Academy. He also wrote the tragedy of 'Idomeneo,' and the comedy of the 'Magnanimous Sisters.' His tragedies are considered his best works.

Cienfuegos, thē-ān''foo-ā'gōs, Cuba, a city in the province of Santa Clara, on the south side of the island. Its harbor, which is one of the finest in the West Indies, was visited by Columbus on his first voyage, and was surveyed by Ocampo in 1508. The town was settled by refugees from Santo Domingo in 1819. Here the revolutionist Narciso Lopez planned to make his first demonstration on 4 July 1847. In recent years its commercial progress has been rapid, and it is now the second seaport of Cuba. Some of the sugar estates in the neighborhood are very large, and conducted on the most approved modern plan; in fact, Cienfuegos is the centre of the sugar trade on the Caribbean coast. It is a city of attractive, well-shaded streets, and substantially built houses. One of its plazas is the largest in Cuba. Among the principal buildings are the governor's house, market, railroad station, and military and government hospitals. Water from the aqueduct is supplied to 42 per cent of the dwellings; from wells, to 47 per cent; from cisterns, to 7 per cent. There are social clubs, a theatre, etc. The city is lighted by gas and electricity. The climate from May to November cannot be highly commended, the air having an excess of moisture, and the temperature ranging from 75° to 98° F. The winter months, however, are very agreeable, winds from the north prevailing, and

CIEZA — CIGAR

the temperature ranging from 60° to 78° F. during the day, with cooler nights. Cienfuegos is connected by rail with Sagua la Grande, on the opposite coast; with Santa Clara, the western terminus of the Cuba Company's main line to Santiago; with Havana, etc. By steamer it is in regular communication with New York, as well as with ports of the southern coast of Cuba from Santiago to Batabano. The population (United States War Department census, 1899) is 30,038. Occupied dwellings number 4,967. Number of inhabitants engaged in trade and transportation, 3,065; in agriculture, fisheries, and mining, 901; in personal service, 4,004; in manufactures and mechanical industries, 3,221; in professional service, 294; without gainful occupation, 18,553. Total school attendance 3,832. Number of persons able to read 18,052, or 60 per cent — a higher percentage in this respect being found among Cuban cities only in Havana (66 per cent) and Puerto Principe (62 per cent). Foreign-born are 11.6 per cent of the city's population. The white people number 19,220; negroes, 3,068; mixed, 7,401; and Chinese, 349. For a time during the Spanish-American war the harbor of Cienfuegos was blockaded by Admiral Schley.

Cieza, thē-ā'thā, Spain, a town in the province of Murcia, and 24 miles northwest of the city of Murcia, on an eminence near the right bank of the Segura. It has spacious streets, a large church and ancient tower, manufactures of linen and hempen fabrics, and a trade in corn, wine, oil, and silk. Pop. 14,000.

Cigar (of uncertain etymology; it cannot be connected with any West Indian speech, and the derivation at present most common among scholars is from Sp. *cigarra*, cicada, in allusion to a similarity of outline; Sp. *cigarro*. Also incorrectly spelled *Segar*), a compact roll of tobacco, for smoking. This form was borrowed by the Spanish invaders from the Indians of Cuba. When the Spaniards found that tobacco would grow elsewhere, they transplanted it to their possessions in the Philippines and in other localities. The Manila cheroot is the common method of smoking tobacco in the Far East. This cheroot is cut off evenly at both ends and is shorter than American cigars. Rolling tobacco into cigars was not generally practised in Virginia and the Carolinas for a long time after the settlement of those sections by the English, for there the Indians invariably smoked their tobacco in pipes, but finally the convenience and superior flavor these rolls possessed made their use quite common some years before the Declaration of Independence of the American colonies. In Cuba, Mexico, and Central America and, in fact, in all Spanish-speaking countries, the use of a pipe to this day is a rarity, the inevitable *cigarro* or *cigarette* ("little cigar") being found constantly in use.

The moist climate, the character of the soil, and the peculiar preservative qualities of the air make Cuba the true home of the perfect cigar. There are but half a dozen valleys, mostly in the western end of the island, where the finest cigar tobacco is grown and cured, the most important being the Vuelta Abajo district. Perhaps the next best comes from Porto Rico. The removal of the duty on manufactured cigars from that island in 1903 flooded

the United States with cigars from there, many of them very inferior. In order to avoid paying the high duties on Cuban-made cigars, the device was early tried of bringing the tobacco over to the small island of Key West, a part of the State of Florida, separated from Cuba by only an 80-mile-wide strait. It was thought that the climatic conditions there would be so similar to those of Cuba that an equally fine cigar could be made there, while the importation of the tobacco in bulk cut down the duties very materially. The "Key West" cigar is much cheaper than the one made in Cuba, but the flavor, for some reason, is inferior. The manufacturers even brought cigarmakers from Cuba to Key West, so that so far as possible the product might be the same as the original, but in vain. It has been discovered by experts of the department that in Ohio and Texas are certain areas which possess a soil so similar to that of the celebrated Vuelta Abajo district of Cuba that it is possible to raise tobacco there that will equal the Cuban. Samples of the leaf grown there and submitted to dealers in New York and Philadelphia, who were not told where it came from, proved to be so similar to that of Cuba that it was pronounced pure Havana leaf of the best quality. The pioneer in the manufacture of Key West cigars was Gen. J. H. Gregory, who gained his military title in the first war for Cuban independence, and was familiar with the internal resources of Cuba.

Tobacco comes to the cigar manufactories in bundles, that intended for wrappers being kept separate. The best tobacco for wrappers is grown in Sumatra. Connecticut wrappers are also much used, being supple and tough. The best cigars made within the limits of the United States are undoubtedly those of Cuban tobacco manufactured in Key West, with a Connecticut wrapper. Those with Virginia, Carolina, Pennsylvania, and other tobaccos as a filler, with the Connecticut wrapper, are of inferior quality, but sell in large quantities, because of their cheapness. The operative spreads the filler leaf on his bench, with a small quantity of the wrapper beside him. He rolls the filler into the proper shape and firmness, then deftly cuts a portion of leaf to form a wrapper, winds the wrapper about the filler, and secures the ends with paste. This is the standard method. Some poorer grades are made by machinery, but the results are not satisfactory and hand-made cigars are still the best and most expensive. Scattered throughout the United States are thousands of large and small factories for the manufacture of cigars, many of them using little machinery. In 1901 there were 6,914,639,012 cigars and 2,728,153,697 cigarettes made in this country. The production of cigarettes has decreased since 1896, when it was 4,967,444,232, the greatest number ever made, and exceeding the number of cigars for that year by over 900,000,000. The reason for this is the persistent fight constantly waged against the cigarette as injurious, most States having stringent laws regulating its sale. The value of this finished cigar product to the makers is probably about \$250,000,000 annually, the consumer paying about \$750,000,000 for it. This does not include the imported article, about 75,000,000 coming from Cuba (1903) and 125,000,000 from Porto Rico and the Philippines. There are some few thousands

CIGARETTE — CIMABUE

of cigarettes imported from Egypt and Turkey, though most of those called so are made in this country from American tobacco. Altogether the number of cigars and cigarettes made or brought into the United States at present is about 13,000,000,000. For further details, including the preparation of tobacco-leaf, see the article TOBACCO.

Cigarette. See CIGAR.

Cignani, chēn-yä'nē, **Carlo**, Italian painter: b. Bologna 15 May 1628; d. Forli 6 Sept. 1719. He was a pupil of Albano. He knew how to compose, like the Caracci, and to distribute his figures in such a way that his paintings appear larger than they really are. His finest fresco paintings are at St. Michael in Bosco, at Bologna, in ovals supported by angels, and in the saloon of the Farnese Palace, where he represented Francis I. of France touching for the king's evil. In his painting of the Assumption, at Forli, he has imitated the beautiful Michael of Guido in the cupola at Ravenna, and other fine conceptions of this painter; but in other pieces he made Correggio his model. He does not so often introduce foreshortenings as the Lombards; and in his outlines and drapery he possesses a finish peculiar to himself. His pencil is powerful, and his coloring lively. Clement XI. conferred on him several marks of distinction. His paintings have been engraved by various artists.

Cignaroli, **Giovanni Bettino**, jō-vän'nē bēt-tē'no chēn-yä-rō'lē, Italian painter: b. Salo, near Verona, 1706; d. Verona 1 Dec. 1770. His best works are in the cathedrals of Pisa, Bergamo, Mantua, and in the churches of his native city and of Ferrara. He educated a numerous school at Verona, and received several invitations to visit foreign courts, which he invariably declined. In style he resembled Carlo Maratti, but formed himself on the works of Guido and Correggio. He was a man of literary culture, and wrote with discrimination and taste on various subjects.

Cilia, sīl'ī-a (Latin, "eyelashes"), small, generally microscopic, hair-like organs or appendages, averaging $\frac{1}{3000}$ inch in length, found on the surface of the tissues of most animals, and in some vegetable organisms (as algæ), chiefly on tissues which are in contact with water, or which produce fluid secretions. They are constantly in a state of active movement, and communicate to the fluid with which they are in contact a corresponding motion. This is called vibratile or ciliary motion. In most of the lower aquatic animals the respiratory function is aided by means of the vibratile cilia; many animalcules move by a similar mechanism; and in the highest classes of animals cilia have a share in the performance of some important functions.

Ciliata, sīl-ī-ā'ta, a group of *Protozoa*, and to which belong most of the *Infusoria* (q.v.). The body is covered with cilia, and it is either free or stalked and attached to submerged plants, etc. The group comprises the most specialized *Protozoa*, including the trumpet-animalcule (*Stentor*), the bell-animalcules (*Vorticella* and *Epistylis*). In these one-celled animals there is for the first time in the animal kingdom, as we ascend from the simplest organ-

isms, a permanent aperture (cytostome) corresponding to the mouth of the higher animals, and an œsophagus (cytopharynx), and the undigested or waste portions of the food are cast out at a fixed point or opening (cytopyge), usually not detected when not used. There is also in the *stentor*, etc., a definite spiral muscle, while netting bodies (trichocyst), like minute rods, in rare cases occur, and are supposed to be defensive in their nature. The ciliate infusoria reproduce by fission, budding, and also by conjugation, molting in the origin of spores or embryos. Certain forms are parasitic; thus the skin disease called eczema has been attributed to the presence of parasitic *vorticellæ*, and a flattened oval free form occurs in the large intestines of men ill with diarrhœa.

Cilicia, sī-līsh'ī-a, in ancient geography the region between Pamphylia and Syria, lying south of Mount Taurus. The inhabitants of the coasts were formidable as pirates, and even disturbed the Ægean and Ionian seas. The inhabitants of the northern portion lived in part a nomadic life; those in the east were devoted to agriculture. Alexander made Cilicia a Macedonian province; it then passed to the Syrians. Pompey subdued its piratical inhabitants. The mountainous parts were left in the hands of the native princes; the rest, in 67-6 B.C., was constituted a Roman province, of which Cicero was proconsul in 51-50 B.C.

Cimabue, **Giovanni**, jō-vän'nē chē-mä-boo'ā, Italian artist: b. Florence 1240; d. there about 1302. Two Greek artists, who were invited to Florence by the senate to paint a chapel in the church of Santa Maria Novella, were his first masters. Although these artists handled the pencil awkwardly, they however taught him, according to ancient tradition, the proportions which the Greek artists had observed in their imitations of the human figure. Attentive to their instructions, Cimabue studied principally the fine antique statues. He was the first to point out to succeeding painters the elements of the *beau idéal*, the memory of which had been extinguished during several centuries of disorder. It is true the paintings of Cimabue do not exhibit that harmonious distribution of light and shade which forms the chiaroscuro. His coloring is dry, flat, and cold; the outlines of his figures intersect each other on a blue, green, or yellow ground, according to the effect which he had in view. He had no idea of linear and aerial perspective. His paintings are, properly speaking, only monochromes. But these faults, which are to be attributed to the infancy of the art, are compensated for by beauties of a high order—a grand style, accurate drawing, natural expression, noble grouping, and a fine disposition of his drapery. His best paintings are in the church of Santa Maria Novello at Florence, and in the Sacro Convento at Assisi. He may be considered the link between the ancient and modern schools of painting. Cimabue evinced a generous appreciation of Giotto, whom tradition says he discovered drawing figures on the smooth surface of a rock while tending his sheep, and whom he took with him to Florence, and instructed with such success that the pupil soon excelled his master. It should be added that there is very little corroborating testimony regarding the works

CIMAROSA — CIMMERIANS

attributed to him by Vasari, and a recent destructive critic has written in the 'Nineteenth Century' for March 1903, "All, then, that we know about this Cenni di Pepi is that he was a distinguished Florentine artist; that he was nicknamed Cimabue; that he flourished in the closing years of the 13th century and the early years of the 14th, and that he executed a mosaic and an altar-piece at Pisa, of which the latter has disappeared and the former has been entirely renewed."

Cimarosa, Domenico, dō-mā-nē'kō chē mā rō zā, Italian composer: b. Aversa, near Naples, 17 Dec. 1749; d. Venice 11 Jan. 1801. He received his first musical instruction from Sacchini, entered the conservatory of Loretto, where he imbibed the principles of the school of Durante, and studied with great assiduity. He soon displayed his superiority in the 'Sacrificio di Abramo,' the 'Olimpiade,' and other compositions. At the age of 25 he had already gained the applause of the principal theatres of Italy. He was invited to St. Petersburg (where he remained four years) and to several German courts to compose heroic and comic operas. In the latter he particularly distinguished himself by the novelty, warmth, humor, and liveliness of his ideas, and by a thorough acquaintance with stage effects. Among his 120 operas the most celebrated are: 'Penelope'; 'Gli Orazj e Curiazj'; and 'Artaserse,' among the *opere serie*; and among the *opere buffe*, 'L'Italiano in Londra'; 'L'Amor Costante'; 'Il Pittore Carigino'; and many others. His comic opera, 'Il Matrimonio Segreto,' excited general enthusiasm, and received the signal honor of being performed twice on the same evening, at the desire of the Emperor Leopold. From Vienna he went to Naples, and became involved there in the revolutionary commotions. He died from the effects of the ill treatment which he had been subjected to in prison. His bust, by Canova, was placed in the Pantheon at Rome in 1816 by the side of those of Sacchini and Paesiello.

Cimbri, sīm'brī, a tribe which inhabited Jutland (the Chersonesus Cimbrica), whence they sallied, together with the Teutones, and became among the most formidable of the enemies of Rome. In the year 114 B.C., when the Romans were already masters of a part of the eastern Alps, in the present Carniola, Istria, etc., and had established themselves in Dalmatia and Illyria, along the coast, immense bodies of barbarians suddenly made their appearance, who overcame the consul Papirius Carbo in the country now called Styria; but instead of entering Italy they proceeded to the north, and soon after, jointly with the Tigurians, entered the territory of the Allobroges. The Romans sent two armies, commanded by the consuls L. Cassius and M. Aurelius Scaurus, to oppose them, but both were defeated—the former by the Tigurians, the latter by the Cimbri. Even after this success the victors did not enter Italy, but overran Gaul with three bodies, consisting of Teutones, Cimbri, and Ambrones. Two new armies, with which the consul C. Manlius and the proconsul Q. Servilius Cæpio hastened to oppose them, were likewise defeated beyond the Rhodanus. The Romans lost, according to Aetius, 80,000 men. While Rome placed her last hope in Marius, the barbarians

overran the other western countries of Europe. Gaul suffered severely, but the Iberians and Belgians repulsed the invaders. Upon this they resolved to descend into Italy. The Teutones and Ambrones were to enter on the western side of the Alps, the Cimbri and Tigurians on the east. After Marius had waited the approach of the first during three entire years, and had accustomed his troops to their appearance, he routed them completely (102 B.C.) in two days—on the first day the Ambrones, on the second the Teutones—at Aix in Provence. The Cimbri, on the other hand, who had driven back the consul Catallus on the Adige, and had spread themselves along the Po, demanded land of the Romans, but were totally routed by Marius at Vercelli 101 B.C. About a century after this the Cimbri sent (from the Cimbrian Chersonesus) an embassy to the Roman emperor Augustus, to offer him presents and to ask pardon for what they had previously done against the Romans. The nationality of the Cimbri is a disputed point. Similarity of name led the ancients to identify them with the Cimmerians, but this view is no longer held. Some authorities believe them to have been of Germanic, others of Celtic race. Their name certainly has a great resemblance to that of the Celtic Kymri; and their armor and customs, according to Plutarch and Strabo, were very different from those of the Germans. "All these circumstances," says Schmitz, in Smith's 'Dictionary of Greek and Roman Geography,' "render it in the highest degree probable that the Cimbri were a Celtic or Gallic and not a Germanic nation."

Cim'brian Panic, The, a Roman panic after the annihilation of five armies by the Cimbrians 105 B.C. This panic rose to its climax after the terrible defeat of Cæpio, the consul in Gallia Narbonensis.

Cimburgis Lip, The, often called the "Austrian Lip" (q.v.). It came from Kaiser Maximilian I., and was inherited from his grandmother Cimburgis, a Polish princess, who married Kaiser Friedrich III.

Cimex Lectularius, sī'měks lēc-tū-lār'ē-ūs. See BEDBUG.

Cimicifuga, sī-mī-sīf'ū-ga, from the Latin, "to drive away," so named because certain species are used to drive away bugs and other insects. The plant is a genus of the crow-foot family, comprising about 20 species, natives of North America, Asia, and Europe. The best known American species, because of their medicinal properties are the bugbane (*Cimicifuga americana*) (q.v.) and the black-snakeroot or black cohosh (*C. racemosa*), supposed to be an antidote for the venom of serpents.

In medicine cimicifuga is used largely by the eclectics as a digestant, cardiac tonic, and uterine stimulant. Its active principles have never been thoroughly determined and little is known of its physiological action as determined by exact pharmacological experiment.

Cimmerian (sī-mē-rī'an) **Bos'phorus**, an ancient name for the Strait of Kaffa.

Cimmerians, sī-mē-rī-anz, a tribe half-mythical, half-historical, described first in the Odyssey as dwelling beyond the ocean-stream, in thickest gloom, unvisited by Helios. Hence the term, "Cimmerian gloom." From Herodotus we learn that they originally inhabited the coun-

CIMOLIAN EARTH — CINCHONACEÆ

try between the Borysthenes and the Tanais, but expelled by the Scythians, they traveled along the shores of the Euxine, passed through Colchis and over the Halys, and entered Asia to the west of that river. Against this it is urged that the route by the Euxine would be impassable for a nomadic people, the Caucasus running down to the very shores of that sea. The sum of our certain knowledge respecting this people is, that they seem to have been the chief occupants of the Tauric Chersonesus (the Crimea), where they had a large city, near which were fortifications enclosing the isthmus by an earthen wall.

Cimolian (sī-mō'li-ăn) **Earth**, or **Cimolite**, sīm'ō-līt or kīm'ō-līt (from Kimolos, one of the Cyclades, in the Ægean Sea, where it is still to be found), a hydrated silicate of aluminum, apparently formed by the decomposition of augite. It is of a light color, compact, and somewhat slaty. Water soon splits it up; when ground with water it forms a thick cream. In classical times it was used as a soap for cleaning delicate fabrics, and by the bath-keepers. It is mentioned by Aristophanes in this connection. It is used in the island as a detergent.

Cimon, Athenian general and statesman: b. about 502 B.C.; d. Citium, Cyprus, 449 B.C. He was a son of the great Miltiades. He fought against the Persians in the battle of Salamis 480 B.C., and shared with Aristides the chief command of the fleet sent to Asia to deliver the Greek colonies from the Persian yoke. The return of Aristides to Athens soon after left Cimon at the head of the whole naval force of Greece. He conquered the pirate-island of Scyros, subdued all the cities on the coast of Asia Minor, pursued the Persian fleet up the Eurymedon, destroyed more than 200 of their ships, and then, having landed, on the same day entirely defeated their army 469 B.C. He employed the spoil which he had taken in the embellishment of Athens, and in 463 reduced the revolted Thasians; but the popular leaders, beginning to fear his power, charged him on his return with having been corrupted by the king of Macedon. The charge was dropped, but when Cimon's policy of friendship to the Lacedæmonians ended in the latter insulting the troops sent by Athens to their aid, his opponents secured his banishment. He retired into Bœotia, and his request to be allowed to fight with the Athenians against the Lacedæmonians in 457 at Tanagra was refused. Eventually Cimon was recalled at the instance of Pericles to conclude a peace with Lacedæmon. He died while besieging Citium in Cyprus. His 'Life' was written by Cornelius Nepos.

Cinapusen, sē-nā-poo'sän, or **Cinapuran Islands**, a cluster of 10 islands of the Tawi group, Sulu Archipelago, lying southwest of the island of Sulu; area 13 square miles. The islands are covered with tropical vegetation, and are mostly resorted to for fishing by natives of neighboring islands. Tabawan, the largest of the cluster is, however, thickly populated; the inhabitants carry on a considerable pearl fishery. They were at one time notorious pirates, but since the destruction of their settlements by a Spanish fleet, have been harmless

and inoffensive. The islands now belong to the United States and are a part of the Military Department of Mindanao.

Cinchona Bark, the bark of several species of *Cinchonaceæ* (q.v.). The following are the most important: *Chinchona flava cortex*, yellow cinchona bark, which occurs as quills covered with a brown epidermis, mottled with whitish yellow lichens, and also in flat cinnamon-colored pieces. They break with a fibrous fracture and the escape of a powder. Yellow bark is rich in quinine, and 100 grains should yield not less than two grains of alkaloid. It is derived from *C. calisaya*, which grows in the peculiar cloudy regions of the Andes. *C. pallidæ cortex*, pale cinchona bark, from *C. condaminea*. It occurs always in quills covered with crustaceous lichens. Its fracture is short and not fibrous. It contains chiefly cinchonine. Two hundred grains of the bark yield about one grain of alkaloid. *C. succirubra* appears to thrive in India. The bark occurs in flattened rough-fibrous, dark-brown red pieces, which are covered with a brown-red epidermis. It breaks with a red fibrous fracture. It contains about equal quantities of cinchonine and quinine, and 100 grains of the powdered bark should yield not less than 1½ grains of alkaloid. The yellow bark is used in the form of decoction, extract, infusion, and tincture. The pale bark is contained in *tinctura cinchonæ composita* and in *mixtura ferri aromatica*. The cinchona barks contain, besides the alkaloids, certain acids having astringent properties, and are valuable as tonics in cases of great debility. Cinchona barks rich in quinine generally contain much lime, and their solutions are precipitated by sodium sulphate. See QUININE.

Cinchonaceæ, sīn-kō-nā'sē-ē, a well-marked order of plants, almost exclusively found within the tropics. Its leaves are simple, entire, opposite, with interpetiolar stipules. The flowers are usually arranged in panicles or corymbs. The calyx is adherent, with a definite number of divisions or none. The corolla is superior, tubular, and regular, with a definite number of divisions. The stamens arise from the corolla, all on the same line, and alternate with its segments. The ovary is inferior, surmounted by a disk, usually two-celled, occasionally with several cells; the style is single, inserted, sometimes partly divided; the stigma usually simple, sometimes divided into a number of parts. The fruit is inferior, dividing into halves, or not dividing, and dry or succulent; sometimes it is many-celled. Many of the species of this order are of considerable importance, being largely used in medicine, acting as tonics, febrifuges, emetics, and purgatives. The species of *Chinchona* yield Peruvian bark. An extract, with some sweetness and a more astringent taste than terra japonica, and called by the Malays gambier, is obtained from the *Uncaria gambir*. Ipecacuanha is the root of *Cephælis ipecacuanha*, a little, creeping-rooted, semi-herbaceous plant, found in the damp forests of Brazil. Coffee is the seeds of a plant of this order, the *Coffea arabica*. A few species bear an edible fruit, such as the genipap of South America, the nahil peach of Sierra Leone, and the voa-vanga, a good dessert fruit in Madagascar. Among dyeing plants there is the

CINCINNATI

Oldenlandia umbellata, whose roots are the chay-root (q.v.) of commerce.

Cincinnati, Ohio, county-seat of Hamilton County, in the extreme southwest of the State, one of the great commercial and manufacturing centres of the Union, tenth in nominal rank, and seventh or eighth in fact. It is situated on the north bank of the Ohio River, almost exactly half way from its origin at Pittsburg to its mouth at Cairo, Ill., about 465 miles by water from each and 315 by rail from the former, and 369 from the latter; and is a station on every trunk line of railroad in the Middle West, being the main terminal of the Cincinnati Southern, Cincinnati, Hamilton & Dayton, Chesapeake & Ohio, and a number of others. It is 138 miles by water from Louisville, and 1,631 from New Orleans, against 114 miles and 1,210, respectively, by rail; 764 miles by rail from New York, and 270 miles from Chicago.

Topography.—Cincinnati occupies the northern half of a circular amphitheatre of hills about two and a half miles in diameter, bisected east and west by the Ohio River—which here makes a great southward sweep. In the southern half, bisected north and south by the Licking, lie its Kentucky suburbs, respectable cities themselves. The northern semicircle rises from the river in two great terraces, sloping northward to a third level at the summit; originally quite distinct, now much confused by grading. The lower platform is a bluff about 65 feet above low water, the second 50 to 100 feet higher, the crest-hills 150 to 300 feet higher yet, or about 475 feet at the summits—Mount Adams, Mount Lookout, Mount Auburn, Fairview Heights, etc.—giving a noble prospect of river and country. Four of these hills can be reached by inclined plane cable railways used in the main for the lifting of the electric cars. They are cut by ravines, and much of the heavy original woods has been left intact, while the remaining ground has been occupied by miles of the finest residence streets in America, parked with shrubbery, lawns, and flower gardens. On the western side of the city from north to south runs Mill Creek, the remains of a once huge glacial stream, whose gently sloping valley half a mile or more wide, forms an easy path into the heart of the city, and was an indispensable factor in determining its position; highways, canals, and railroads come through it, and the city's growth has pushed much farther up this valley than in other directions. The railroad stock yards are on its eastern slope. Cincinnati extends for about 14 miles along the river front, to a width of about five in an irregular block north from it, but attains a width of six or seven miles at the extreme point along the creek valley. The total area thus far in the city limits is 42½ square miles; much more is legitimately a part of it.

Municipal Conditions.—The site of the city is a glacial moraine of gravel and boulders, cut through by the Ohio; there is therefore little bottom land, and has been from the first little of the malaria which was long such a scourge and reproach to western settlements; and this, with the moderate climate, averaging about 75° in summer and 34° in winter, and the easy sewerage down the slopes into the Ohio and away from the city, has given it excellent sanitary conditions, its death-rate falling from 21 per 1,000

in 1890 to 19 in 1900, and 18 at present. The city owns its own waterworks and 449 miles of mains. The water is pumped from the Ohio River into reservoirs in Eden and Third Street Parks, having a capacity of 106,000,000 gallons, the daily consumption being about 44,000,000 gallons. The system is now being extended at an approximate cost of \$10,000,000, and will when completed draw its supply from the Kentucky side of the Ohio opposite California about eight miles up the river and beyond all contaminating sources. The extension includes a complete mechanical filtration plant at the new reservoirs, which will have a capacity of 350,000,000 gallons. With the completion of the new waterworks perfectly pure water will be delivered direct to the consumer. The city has 641 miles of streets, of which 391 miles are paved with macadam, granite, asphalt, etc.

Interior, Suburbs, etc.—The bottom level below the bluffs, along the riverside, is of course the seat of the river shipping business, and has as well the usual fringe of low quarters; it is paved and there is a broad "public landing" fronted by floating docks, wharf-boats, etc. Above are the wholesale and then the retail business streets, with great extent and variety of fine business architecture, and gridironed with electric roads, of which there are some 225 miles within the city limits. The principal lines converge at or near Fountain Square (see below), and connect with a ring of beautiful suburbs, within and without the city limits, unsurpassed in America. To the north are Clifton, Avondale, Mount Auburn, Vernonville, College Hill, Winton Place, Linwood, Elmwood, Hartwell, Lockland, Glendale, Norwood, Oakley, Walnut Hills, Mount Lookout, etc.; across the river, over which, on three bridges, the electric lines run, are numerous cities and towns, including Covington, Ludlow, and Milldale to the west of the Licking, and Newport, Bellevue, Dayton, and, far beyond, to the east, Fort Thomas, a leading army post. The section lying to the north and east of the canal which intersects the plateau at the foot of the suburban hills is largely occupied by Germans, from which circumstance it is frequently referred to as "over the Rhine." The river is crossed by five bridges, each more than half a mile long, one exclusively for railway traffic, two for highway, and two for both; the truss-bridge of the Cincinnati Southern to Ludlow—costing \$3,348,675, with one of the longest spans in the world—the cantilever of the Chesapeake & Ohio to West Covington; the great wire suspension bridge to Covington, designed by John A. Roebling, and completed in 1867 at a cost of \$1,800,000, and two wrought-iron bridges to Newport, one of them used by the Louisville & Nashville R.R.

The original town was laid out as a checker-board, with streets four rods wide, the conventional form of the artificial American town; but the irregular surface and individual tastes have given them greater variety since, and no city has a finer field for picturesque architecture. The older residence streets were monotonous rows of low brick houses, but the newer ones have a remarkable variety both of form and material. A local freestone and blue limestone are much used in building, as well as brick with steel framing. The most notable public buildings, besides churches mentioned below, are the gov-

CINCINNATI

ernment building (post-office, custom-house, etc.) of brick and iron with sawed freestone facing, 180 feet by 50, and costing \$5,200,000; the county court-house (Romanesque), replacing the one destroyed by the mob in 1884, with the jail in the rear, the whole occupying an entire square; the beautiful city-hall, completed in 1893 at a cost of \$1,266,956.10; the city hospital, of eight buildings around a central court, occupying a square of nearly four acres, and costing over \$700,000 exclusive of grounds; the city work-house, the university buildings, the Chamber of Commerce, one of H. H. Richardson's last designs; the magnificent Music Hall, the gift of Reuben R. Springer and others; the Romanesque public library, costing \$675,000; the Masonic Temple (Byzantine), Odd Fellows' Temple, Y. M. C. A. Building, Art Museum, the Queen City, Cincinnati and Phoenix clubs, Lafayette and Third National Bank buildings, Rookwood Pottery, St. Francis Xavier's College, a splendid structure; the Central Union depot, the city markets, and the sky-scrappers of 15 to 20 stories, one of which, the Ingalls Building, is the tallest concrete structure in the world, as well as smaller but admirable bank and other business buildings. Of public monuments, by far the most artistic is the Tyler-Davidson Fountain, with a surrounding esplanade, on Fifth Street, between Vine and Walnut, in Fountain Square, the centre of most of the street car lines. It was presented to the city by Henry Probasco in 1871, having been cast at the Royal Foundry in Munich at a cost of \$200,000, and is regarded as the finest fountain in the world, and one of the world's chief art treasures. The equestrian statue of President William Henry Harrison (first governor of Ohio), the statues of Garfield, Lincoln, Hecker and McCook, and the Fort Washington monument also adorn the city.

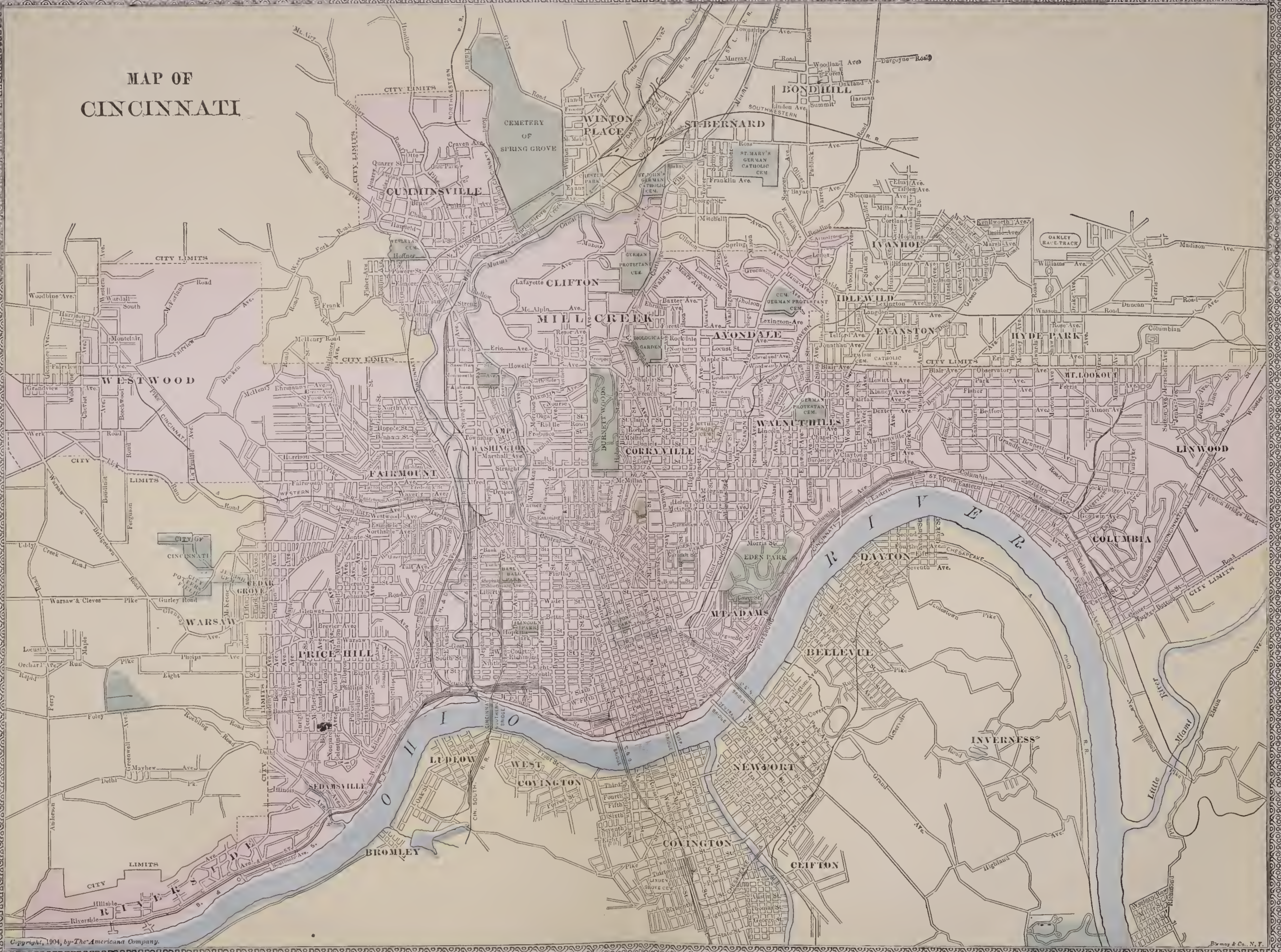
Parks, Cemeteries, etc.—The park system comprises 540 acres, in three large bodies on the hills and seven smaller ones. The largest is the superb Eden Park, containing 210 acres, on Mount Adams in the northeast centre, containing the two main city reservoirs made to look like lovely natural lakes; there is also a high water tower with steps to the top, commanding a matchless prospect. The Art Museum and Art School, the gift of C. W. West, Joseph Longworth, David Sinton, R. R. Springer, and others, two beautiful buildings costing \$450,000, is within the grounds, which are entered by a mediæval gateway, Elsinore, much admired. The next largest park, and equally picturesque, is Burnet Woods in the north centre, with about 160 acres; it contains the grounds, 30 acres in extent, of the University of Cincinnati (q.v.), and another exquisite lake. The zoological gardens, northeast of Burnet Woods, with 60 acres of wild natural beauty, is the home of a varied collection of wild animals and birds, regarded as the best in the country. Lincoln, Washington, and Hopkins are the finest of the smaller parks. Most of the 20 cemeteries are in the northeast, though one or two are in the extreme southwest; but the one superb burial ground, one of the largest and most charming in the country, is Spring Grove Cemetery, about six miles north on the western slope of Mill Creek Valley, with 600 acres of fine landscape gardening and native beauty, and reached by an avenue 100 feet wide. It has a bronze statue as a soldiers' monument,

and a number of magnificent and costly mausoleums.

Amusements, Clubs, etc.—Cincinnati's large German population, with the healthy taste of that element both for recreation and music, has given it a foremost place in these lines. Music is cultivated in a number of well patronized institutions, the College of Music and the various conservatories, and the biennial May festivals are an indispensable part of the city's higher life and are known throughout the world. Other important features of the musical life are the permanent symphony orchestra, the Apollo and Orpheus clubs and a large number of German singing societies. The grand Music Hall is a monument of the munificence of Reuben Springer, who founded it and gave part of its endowment; it is 500 feet by 300, has a seating capacity of over 4,000, and its organ is one of the largest in the country. There are also the Grand, Robinson's, and Heuck's Opera houses; the Walnut Street, Columbia, Lyceum, and People's theatres, the Auditorium, College and Greenwood halls, the Turner and Arbeiter halls, etc. The chief clubs are the Queen City, Business Men's, Phoenix, Cincinnati, Cuvier, Country, Commercial, and Literary. The Cincinnati Gymnasium has extensive suburban athletic grounds and owns a fine city building. There are two favorite summer resorts on the Ohio, one on the Kentucky shore called the Lagoon, and Coney Island, some miles up the river. Chester Park, near Spring Grove Cemetery, is also a well-equipped resort.

Business Interests.—The position of Cincinnati as a midway port on the great central channel of one of the most fertile districts of the world, added to its location on a platform above the floods which washed away its rivals, was the origin of its greatness; but that river traffic has greatly declined since the advent of railroads. Even yet, however, it is invaluable for the transportation of bulky freight—coal, ore, iron, lumber, salt, etc.—to manufactories, and the distribution of its products to the Ohio and Mississippi and their tributaries. A number of regular packet lines still run to Louisville and the Mississippi ports as far as New Orleans, up the Ohio to Pittsburg, to the Big Sandy, Cumberland, Tennessee, and Green, the Red, White, Arkansas, Yazoo, etc., covering 1,200 miles of the Ohio, 850 of the Mississippi, and 2,000 of tributaries. About 100 vessels a year register for this inland commerce, with a tonnage of some 18,000; but there is a much greater commerce than this indicates, as one towboat will push many barges in front of it, a method peculiar to western rivers. The government improvements, dredging and lighting the channel, have greatly aided to keep this navigation alive. Furthermore, by the Miami Canal to Lake Erie at Toledo, much heavy raw material is still brought in at rates the railroads cannot meet. The immense railroad business has already been referred to. Sixteen roads enter Cincinnati; the passengers of most of them come into the Central Union Depot at Central Avenue and Third Street; but a few, of which the Pennsylvania, and Cincinnati, Hamilton & Dayton are chief, have separate stations. The Cincinnati Southern road, 338 miles long, was built and is still owned by the city, and is operated by the Queen & Crescent route under lease.

MAP OF CINCINNATI



CINCINNATI

The trade and manufacturing interests of the city are enormous, even beyond the proportion of its size. It has 13 national banks, clearings aggregated \$1,154,647,600 for 1903. It has also a number of State and private banks. The building and loan associations, which had grown to number 309 in 1902, are being largely absorbed by new and strong trust companies and savings banks. The slaughtering and packing of meats, especially pork, has long been and is still one of the leading branches of commerce, the city packing more than half the meat product of the State. Cincinnati holds the first position in this country in sales of pig-iron, the total yearly receipts and sales for direct shipment amounting annually to nearly \$50,000,000. The number of industrial establishments is about 8,000, employing a capital of about \$135,000,000, and 110,000 workmen, and occupying real estate valued at \$65,000,000, with an annual product of \$315,000,000. The value of commodities received (latest estimate of Chamber of Commerce) was \$545,000,000, while the value of the principal commodities shipped was \$505,061,615. According to the census of 1900, the greatest single branch is iron work, including pig, castings, foundry and machine-shop products, and architectural iron work, \$12,384,848; others, men's clothing (factory-made), \$11,950,648; slaughtering and meat packing, wholesale, \$9,532,057; distilled liquors, \$9,419,687; factory-made boots and shoes, \$8,788,424; carriages and wagons, and their material, \$7,233,048; tobacco products, \$6,768,467; malt liquors, \$6,387,383. Other great products are leather and leather goods; furniture, lumber, timber, and woodworking products; coffee and spices, roasted and ground; saddlery and harness; pickles and preserves; undertakers' goods; musical instruments; soap and candles; electrical supplies; flour and grist; plumbers' supplies; patent medicines; and society regalia, costumes, banners, etc., in which Cincinnati heads the United States. Other products number hundreds, many curious and interesting.

Educational Institutions, Libraries, Newspapers, etc.—Cincinnati has a thorough system of public schools, with 52 grammar schools (including one for deaf-mutes), and three public high schools, the Hughes, Walnut Hills, and Woodward; with about 850 teachers; and 15 private academies and secondary schools, besides several score of Catholic parochial schools. For higher education, the chief is the University of Cincinnati, expanded from the old McMicken University, the capstone of the system of public instruction, with affiliated law, medical, and dental departments, and in connection the famous observatory now located on Mount Lookout—one of the earliest in the United States, with an 16-inch refractor and a new meridian circle, and with a notable record in the investigation of double stars. The university buildings are in a 30-acre space set off by the city in Burnet Woods Park. The Ohio Mechanics' Institute, one of the most important educational forces in the city, has a large, thoroughly equipped building and library, and maintains both day and night schools, attended by hundreds, in which regular classical, literary, and scientific instruction and courses of lectures are given. There are also half a dozen medical and surgical schools, besides training schools for nurses in the hospitals; two other dental colleges; a night law school; sev-

eral business colleges and schools of expression; Lane Theological Seminary at Walnut Hills (1832), famous for Lyman Beecher and Calvin E. Stowe, and for its slavery dissensions; two Roman Catholic colleges, St. Francis Xavier (1840), and St. Joseph's (1873); 5 Catholic seminaries for the education of priests, and 6 Catholic female academies and seminaries, leading to orders; the Hebrew Union College for educating rabbis, the chief one in the United States; the Art Museum and Art School founded by Cincinnati ladies on the model of South Kensington, with two large buildings and several hundred students, and a valuable collection of works of art. The Cincinnati Society of Natural History has a museum of valuable and interesting relics open to the public. Of the libraries, the chief is the free Public Library, handsomely housed on Vine Street. (with over 300,000 volumes and pamphlets), and various suburban branches. There are 16 others, subscription and institutional, of which the chief are the Young Men's Mercantile, the Law Library, that of the Mechanics' Institute, the library of St. Xavier's College, Lloyd Library and Museum, the University Library, and the Historical and Philosophical Society has the finest collection in existence of original manuscripts, pamphlets, and bound volumes, pertaining to the history of Cincinnati and the State of Ohio, and ranks among the first institutions of the kind in the country. There are in 1904, 19 daily newspapers, 12 English, 6 German, and one Italian; 70 English and 13 German weeklies; 79 monthlies, 23 quarterlies, and 14 of various other kinds, 229 periodicals in all.

Churches and Charities.—Cincinnati in 1903 had 269 church bodies, 60 Roman Catholic (besides five convents), 180 Protestant of various denominations, 12 Jewish synagogues, and 17 unclassified, including Christian Science, Spiritualist, etc. The city is the seat of a Roman Catholic archbishop and a Protestant Episcopal bishop, with cathedrals of both. The finest church building in Cincinnati is the cathedral of the former (St. Peter's), in pure Grecian style, 180 feet by 60 and 90, with a spire 224 feet high. Other prominent churches are the First Presbyterian, with a tower and spire 285 feet high, the loftiest in the West, surmounted by a gilt hand pointing upward; the Second Presbyterian; St. Francis Xavier and the St. Francis de Sales (Roman Catholic) on Walnut Hills (with the largest swinging bell in the world); the Hebrew Synagogue and the Temple; Christ's and St. Paul's Protestant Episcopal, and St. Paul's Methodist Episcopal; the Ninth Street Baptist; the Unitarian; and the Church of the New Jerusalem (Swedenborgian).

There are 53 benevolent associations in the city, covering every class and grade of alleviable human misfortune; an infirmary; a house of refuge for irreclaimable children; and a workhouse, with workshops and work grounds. Prominent among the 17 hospitals, public and private, are the large city hospital, the Jewish Hospital, Good Samaritan, St. Mary's (both Catholic), Longview Asylum, United States Marine, Bethesda, the Ohio Hospital for Women and Children, the Presbyterian, the Elizabeth Gamble Deaconess Home and Christ Hospital, and the Laura McDonald Memorial. There are also numerous homes for the aged and infirm, for

CINCINNATI

orphans, for incurables, and the friendless, non-sectarian, and denominational, all splendidly equipped, and a fresh-air fund and farm.

Government, Finances, etc.—The government is "federal"; there is a two-years' mayor, who appoints non-partisan election, supervisory, and public safety boards (in control of the fire and police departments); a (legislative) council of one from each ward; other boards and officers elected by the people, including an administrative board of public service, and a board of education. The city debt is about \$25,000,000, but \$18,000,000 of this is for the Cincinnati Southern line, which returns \$1,000,000 a year rental. The tax-rate is \$22.70 per \$1,000. The yearly disbursements are about \$7,000,000, of which over \$1,000,000 is for schools.

Population.—In 1800, 750; 1810, 2,540; 1820, 9,642; 1830, 24,831; 1840, 46,338; 1850, 115,435; 1860, 161,044; 1870, 216,239; 1880, 255,139; 1890, 296,908; 1900, 325,902. The census bureau estimate for 1904 is 332,934, which obviously does not include the territory annexed to the city in March 1904. This does not convey accurate information, however, without supplemental figures based on the position of the city with nearly a third of its business population resident across the river in another State, as well as several populous suburbs in other townships to the north. Newport, Bellevue, and Dayton, Ky., east of the Licking, contained in 1900 40,761; Covington and Ludlow, west of it, 49,989, or 90,750 in Kentucky; while Mill Creek and Columbia on the north had 34,629—a grand total of 451,281.

History.—The site of Cincinnati at the time it first came under the eye of the white man was covered with "ancient works," monuments of a prehistoric race. Traces of many of these "works" still abound in the neighborhood, which is a centre of the so-called "Mound Builders" remains. Here, too, ran the old Indian trail leading from the British trading post at Detroit to the Licking River, and into the section south of the Ohio. Numerous bands of savages swept through the valley of the Miamis, subsequently called the "Miami Slaughter House," on their marauding expeditions against the Kentucky pioneers. It was in pursuing one of these bands of "horse thieves" that Benjamin Stites first noticed the fertility of the section and its desirability for settlement. As a result of his efforts came the "Miami Purchase."

John Cleves Symmes, with other members of Congress who had been interested by Stites, in 1787 began negotiations with the government for the land lying between the Miamis, which resulted in a conditional purchase that on survey proved to be some 600,000 acres, of which he ultimately received about half. Early in 1788 he sold 740 acres opposite the mouth of the Licking to Matthias Denman and others, with whom he visited the spot later and selected it as the site for a city, to be called Losantiville—a combination of Latin and French, meaning "town opposite the mouth of the Licking." After some shiftings of ownership, a firm consisting of Israel Ludlow, a surveyor, and two others, took possession 28 Dec. 1788, and Ludlow laid out a village with the present Central Avenue and Broadway, about three quarters of a mile apart, for east and west boundaries, and Seventh Street, about as far from the river, for

northern, blazing the street lines on the trees. Three or four log-cabins were built, and the flooding out of several Ohio River town sites about this time left Cincinnati the chief survivor. The building of Fort Washington by the government in the summer of 1789, just east of Broadway, still further confirmed its primacy, for the Indians were a terrible menace until long after. In January 1790, General Arthur St. Clair, newly appointed governor of Northwest Territory, arrived, laid out Hamilton County (named after Alexander Hamilton), and made its seat the new town, whose name he changed to Cincinnati (Symmes, who professes to have suggested the change, was tenacious for Cincinnati), after the famous society of Revolutionary officers, of which he was a member. By the end of 1790, it had some 40 log-houses. The defeats of Harmar (1790) and St. Clair (1791) nearly caused its abandonment in a panic, but the importance of the fort kept the settlement alive. In 1792 as many as 354 lots had been taken for building; and so important a centre of commerce had it become even then that 34 of its buildings were warehouses well stocked with goods. It had some 900 inhabitants, but many of them were floaters. A visiting missionary reported that the people resembled those of Sodom, and the town, like others on the north bank of the Ohio, was thronged with frontier idlers and lawless ruffians who took refuge in Kentucky when brought to book; but as the first church (Presbyterian) was built this year, and the first school (pay) opened with 30 scholars, perhaps some of this language was "common form." Also as settlers were compelled by law to take their loaded guns to church for protection against Indians, it was no place for the tamer sort. In 1793, the 'Centinel of the Northwest Territory,' the first newspaper published north of the Ohio, appeared, and a year later the first through mail to Pittsburg was started in a canoe, and a packet line of keel boats to Pittsburg was organized. Wayne's crushing defeat of the savages at Fallen Timbers, bringing peace to the frontier, was in one sense disastrous to Fort Washington, as settlers swarmed all over Ohio, and it ceased to be the one centre. This defeat, however, assured the permanency of Cincinnati, which increased slowly but surely until in 1800 its population was 750, a growth of 50 per cent since 1795. In December 1801 the seat of territorial government was removed to Chillicothe. But its 12 years' primacy, the army post making it a depot for supplies, and its frontier position, had given it a safe start. In 1802 Cincinnati was incorporated as a town. A well-known picture of the town also dates from this year, in which, too, a "Young Ladies' School" was started, indicating a superior grade of population; and from February to May 1802 over 4,400 barrels of flour were exported, showing its development as a distributing port. The first bank, that of the Miami Exporting Company, was started in 1803. In 1805 the town had 960 people and 172 buildings. But immigration set in much more strongly a year later, and the names show an extraordinary intellectual calibre in the settlers it was attracting. In 1810 it had 2,300 inhabitants, and was the largest town in the State, the centre of immigration to Ohio, and with a great commerce along the river, and was contemplating a university. The first book de-

CINCINNATI

scriptive of the place appeared this year written by the celebrated Dr. Drake. In October 1811 the New Orleans (steamboat) passed the town on her first trip from Pittsburg to Louisville. A stone steam mill 110 feet high of nine stories and with foundation walls 10 feet thick, dates from 1812. In 1814 Lancaster Academy, afterward Cincinnati College, was founded. In 1819 the town received a city charter, having according to the first directory, published this year, 9,873 inhabitants, mostly from the Northern and Middle States, but also many foreigners, so that it was "not uncommon to hear three or four languages spoken in the streets." Another little book descriptive of the city published in 1826 was republished in England and, translated into German, circulated on the continent and attracted a large number of immigrants, especially Germans, who by 1840 numbered one fourth of the population. But its great development came with the opening of the Miami Canal, the most important single influence in the history of the city, for which ground was broken in 1825 at Middletown, and which was completed to Cincinnati in 1827. This not only developed commerce, but furnished great waterpower for manufacturing. The first railroad, the Little Miami, was chartered in 1836, but was not opened till 1846, the first section not till 1843. Even before this the growth was very rapid, population nearly trebling 1820-30, and nearly doubling 1830-40; but the next decade showed the tremendous leap from 46,000 to 115,000. From 1840 the immense immigration of Germans increased so rapidly as to make it for years the typical German city, and this element still constitutes a large proportion of the population. The Germans took great interest in grape culture, and "the banks of the beautiful river" were festooned with vines and the city for some years was a great wine market. It was the great German population that caused the first Saengerfest of the North American Saengerbund to be held here in 1849, a great stimulus to the musical activity of a city since so famed in the musical world. Several times the city was fearfully ravaged by the cholera, beginning with 1832-4; in 1849 and 1850 over 9,000 souls, or nearly 8 per cent of the entire population, perished of it. Yellow fever came in 1878. Floods have also risen over its platform several times and laid the lower section under water; those of 1832 ("the year of flood, fire, pestilence, and famine"), 1883, 1884, having been especially high and destructive. In 1838 the new and beautiful steamer Moselle exploded in front of the landing with a loss of almost a hundred and forty lives, one of the most terrible river disasters of the country. Two years later the city was the centre of the "log-cabin" campaign, which sent a favorite son, William Henry Harrison, to the White House. At a later time Hayes, whose previous active life had been spent in this city, occupied the Presidential position, and Salmon P. Chase, another famous Cincinnati, was Chief Justice of the United States. A continuous excitement of the city was its fury over the race question and later the abolition movement. The vast Northern interest in Southern trade was everywhere a powerful restraining influence on this; but Cincinnati, on the border, and with its daily bread dependent on this trade, besides having a considerable percentage of its people of Southern birth

and detesting the movement on general principles, felt menaced with entire industrial ruin if the agitation were not put down by force. Lane Seminary was threatened with fire, and its faculty with lynching if the students were not prohibited from discussing slavery; and in 1836 and 1841 James G. Birney's Philanthropist press was wrecked by the mob. In fact anti-negro riots were frequent and arose upon the slightest provocation. The trouble was later aggravated by the fact that Cincinnati, being a border city, was a chief station on the "Underground Railroad"; one Quaker citizen boasted of aiding 3,000 fugitive slaves to escape, and in all several times that number must have been smuggled across. Here, too, were tried the celebrated "fugitive slave cases," the Rosetta and Margaret Garner cases. In 1856 Buchanan was nominated for the presidency in Cincinnati; later nominees of Cincinnati conventions were Greeley in 1872, Hayes in 1876, and Hancock in 1880. When the war broke out, however, it became a strong Union city, and its record is noble. In 1862 the fear of an assault by the Confederate, Kirby Smith, caused it to be put under martial law for awhile; a somewhat similar experience came in 1864 at the time of the John Morgan raid. Another war incident was the Vallandigham case. Cincinnati sent its citizen, George B. McClellan, to command the armies of the North. The decade prior to the war had not been one of great progress, but in spite of the decay of trade with the South, the city leaped forward with the resumption of peace. The desire to renew the relations with its old business associates induced it to enter upon the construction of the Cincinnati Southern Railway to Chattanooga, which was built by the city itself, an extreme instance of municipal ownership. The celebrated "Bible" case in 1869 resulted in the abolition of religious instruction from the public schools and gave national fame to the bar that included such lawyers as those who argued the case. In 1869 began a series of annexations, which in a few years increased the city area from 7 square miles (3 when incorporated in 1819) to 24 square miles. Annexations in 1895 and 1903-4 have brought the area to 42½ square miles. The most notorious event in its later history is the "Cincinnati Riot" of 28-31 March 1884. As usual in modern times, the law had protected the criminal against the community till the criminal law was felt to be a farce; some murderers had received absurdly light sentences, and the patience of the lower orders gave way; they attempted to break into the jail and lynch the prisoners; foiled in this, they assaulted the court-house, and burned it, as well as its records and other buildings adjoining; the State militia had to be called in, and in the fray that ensued 45 persons were killed and 145 wounded. In 1888 the centenary of the settlement of the State and city was celebrated by a Centennial Exposition of the Ohio Valley, the culmination of a series of industrial expositions that had attracted the attention of the country and given a director-general to the Centennial at Philadelphia in 1876.

Consult: Ford, 'History of Cincinnati and Hamilton County' (1880); Miller, 'Cincinnati's Beginnings' (1880); Greve, 'Centennial History of Cincinnati' (1904); Drake, 'Picture of Cin-

CINCINNATI ANTICLINE — CINCINNATI, UNIVERSITY

cinnati' (1815); Drake and Mansfield, 'Cincinnati in 1826'; Cist, 'Cincinnati in 1841'; 'Cincinnati in 1851'; 'Cincinnati in 1859'; 'Cincinnati Miscellany' (1844-5); Stevens, 'Cincinnati' (1869); Burnet, 'Notes on Northwest Territory' (1845); Mansfield, 'Personal Memories, 1803-1843'; Directories of 1819, 1825, and 1829; and Mrs. Trollope, 'Domestic Manners of the Americans.'

JUDSON HARMON,
Ex-Attorney-General United States.

Cincinnati Anticline. In the period of disturbance which marked the close of Ordovician time in North America, the limestones deposited during the Trenton Epoch in the interior sea that covered most of what is now the Mississippi Valley were forced up, on a line running through southern Ohio, Kentucky, and Tennessee, in a low, broad arch. This arch is called the Cincinnati Anticline. It has been of much economic importance from its having contained great reservoirs of petroleum and natural gas, the latter now approaching exhaustion. See ORDOVICIAN SYSTEM; TRENTON EPOCH.

Cincinnati, Society of the (as having left the plow, like Cincinnatus, for their country's service, and returning to it when the need was over): a memorial society organized by the officers of the American Revolutionary army, 13 May 1783, just before their final dispersion, from the camp on the Hudson near Fishkill. The first meeting was in the Verplanck House, Steuben's headquarters. A society was organized for each State, besides the general society of which Washington was elected president. Membership was confined to officers of the Continental army who had served with honor three years, or been honorably discharged for disability, whether native or foreign, and to their direct male descendants in order of birth, through females in default of males, and then to collaterals if judged acceptable to the society. Partly as including several European nobles (Lafayette, Steuben, etc.), this was considered the beginning of an aristocratic order on European models, obnoxious to popular liberties. Of course it could only become such by government recognition, but the principle of heredity is *per se* un-American. With more show of reason, it was regarded as a military conspiracy to appropriate all the offices under the new government; a sign that the officers did not intend to be Cincinnatuses if they could help it. It was regarded by high and low as a grave public danger; and all the Revolutionary chiefs who had not been in the army, and were ineligible,—Franklin, Adams, Jefferson, etc.—distrusted its possibilities if not its motives. The legislatures of Massachusetts, Rhode Island, and Pennsylvania adopted resolutions censuring it as dangerous to the liberty and safety of the country; the governor of South Carolina denounced it in his message to the legislature; and the Irish chief justice of the same State, Ædanus Burke, wrote a pamphlet signed "Cassius," proving that it would subvert everything gained by the Revolution. This pamphlet was translated into French, and used by Mirabeau some years later. At the first general meeting, 7 May 1784, Washington persuaded them, in view of this public excitement, to abolish this hereditary feature. This, however, did not wholly conciliate popular feeling; and in 1789 the Tammany Society was

founded in New York in avowed opposition, as a body where true equality should govern, and private advantage should not prevail over disinterested public spirit.

In 1787 Washington was elected president-general, and re-elected till his death; Alexander Hamilton succeeded him. Most of the State societies soon died, and the general society languished. When Lafayette visited this country in 1824, he was the only surviving major-general. The old hero's reappearance galvanized it into new life for a short time, but it sank out of sight again, and for many years was virtually dead, its chief function being an annual dinner in New York. Even a nominal organization was retained only in three or four States. The last survivor of the original association was Robert Burnet of New York, who died in 1854. In 1893 the general society began a successful effort to induce the States to revive or re-form their branches, and Connecticut first (1893) and Georgia last (1902) fill up the roll of the 13. Some of them issue publications.

The president-generals of the society have been: George Washington, Alexander Hamilton, Charles Cotesworth Pinckney, Thomas Pinckney, Aaron Ogden, Morgan Lewis, William Popham, H. A. S. Dearborn, Hamilton Fish, William Wayne, and Winslow Warren.

The emblem of the society, adopted at the outset, was a bald eagle suspended by a dark-blue ribbon with white borders, symbolizing the union of France and America. On the eagle's breast is Cincinnatus receiving a sword and other military insignia from the senate; in the background, his wife stands at the door of their cottage, with the plow and other agricultural implements near; round the whole are the words, *Omnia reliquit servare rempublicam* ("He left all to serve the commonwealth"). On the reverse, Fame is crowning Cincinnatus with a wreath, inscribed *Virtutis Præmium*; in the background, a seaport city with gates opened and vessels entering; below this are joined hands supporting a heart inscribed *Esto Perpetua* ("Be thou perpetual").

Cincinnati, University of. The University of Cincinnati owes its existence primarily to a bequest of Charles McMicken, who, in 1858, left \$1,000,000 worth of property to the city of Cincinnati to found and maintain a college. One half of this property consisting of real estate in the State of Louisiana was lost in 1860 by a decree of the Supreme Court of the United States, annulling that section of McMicken's will giving this property to the university on the ground that the testator could not bequeath real estate in Louisiana to a foreign corporation. The university receives support from the city to the extent of $\frac{3}{10}$ of a mill on the total city tax. Other gifts have been utilized to contract buildings and to increase the endowment fund. The total value of the property and endowment was \$2,260,761 in 1904. From 1858 to 1874 the income from McMicken's estate not being sufficient to support a college or university, the trustees decided to wait until a fund should accumulate or until additional support could be gained. Thus the present University of Cincinnati was not founded until 1874, although three departments of the university are much older, namely, the Astronomical Department, founded in 1842;

CINCINNATI.



1. Fountain Square: Tyler-Davidson Fountain.

2. University of Cincinnati Buildings.

CINCINNATUS — CINEMATOGRAPH

the Medical Department, founded in 1819; the Law Department, founded in 1819 (Cincinnati College). Until 1899 the University was composed of the following departments: Medical (founded 1819); Law (1819); Astronomical (1842); Academic (1874). Since 1899 the following departments have been added: the College of Engineering, offering courses in civil, electrical, chemical, architectural, and hydraulic engineering; the University Summer School; the University Library; the Teachers' College; the University Press; and the Technical School, which furnishes the shops to the Engineering Department, and is an integral part of the Teachers' College. The reorganization was effected under the presidency of Howard Ayers, LL.D. The Dental Department and the Clinical and Pathological School are only affiliated with the University of Cincinnati, having no financial or other connection with the University. The following scholarships are awarded to students of this university according to merit: the C. G. Comegys scholarship with an annual stipend of \$50; five University scholarships with an annual stipend of \$75; five McMicken honorary scholarships; twelve Thoms scholarships; the D. A. R. fellowship in American History established by the local chapter of D. A. R., with an annual stipend of \$200. No tuition is charged to residents of the city of Cincinnati who enter the university as students. All others who enter the Academic Department are charged a tuition of \$75 per year. The professional schools charge from \$75 to \$125 annual tuition. The University of Cincinnati possesses a beautiful location in Burnet Woods Park, away from the noise and dirt of the city. Its government is by a board of directors appointed for six years by the mayor of Cincinnati. The intellectual life of the University finds expression in the publication of many memoirs, and monographs on literary and scientific subjects through the very important department of the University that has been recently established, namely, the University Press. These contributions to knowledge in the form of an annual volume of university bulletins are distributed by exchange all over the world. The total number of laboratories in the University is 35 in 1904; the total number of volumes in the University Library, including pamphlets, is 143,463. The teaching corps numbers 156, and the students 1,360.

HOWARD AYERS, LL.D.,

President of the University of Cincinnati.

Cincinnatus, *sĭn-sĭn-nā'tŭs*, **Lucius Quinctius**, a patrician belonging to the earliest period of the Roman republic: b. about 519 B.C. The legend which makes him the beau-ideal of the virtuous Roman is as follows: The Romans of his day were weakened by dissensions between the patricians and plebeians; the warlike Æquians, after making harassing incursions into their territory, succeeded at last in surrounding the Roman army under the consul Minucius in the wooded grounds of Mount Algidus. In despair the Roman senators went to Cincinnatus, offering him the dictatorship. The messengers found him at the plow. Reluctantly he accepted the office. He succeeded in rescuing the army from its perilous position, and marched to Rome laden with the spoils of victory. He then returned to his farm, whence

he was again called at the age of 80, to resume the dictatorship, to oppose the machinations of Spurius Mælius, and prevent a civil war between the upper and lower classes, which he succeeded in doing.

Cinematograph, *sĭn-ĕ-măt'ō-grăf* (Gr. *κίνημα*, "movement," from *κινῆν*, "to move"), an ingenious instrument introduced about 1895 by two brothers Lumière of Lyons, and founded on the same principle as Edison's kinetoscope. The most important part of the instrument is a sensitive photographic film or band about an inch and a quarter broad and about 50 feet long. This band passes over a drum of moderate size, then down and round a small one, which deflects it upward toward another small drum, and after passing over this one it winds round another large drum in the centre of the instrument proper. Each portion of the film in the course of its motion passes vertically close behind an opening situated above the last three drums, but below the first one. This opening does not communicate directly with the outside, but is placed in the partition dividing the part of the apparatus containing the last three drums from an adjacent part situated below that containing the first drum. Facing this aperture, and fixed in the opposite wall of that box which does not contain the three drums, is an objective through which light passes into the interior. Thus, by means of a peculiar arrangement of eccentrics which secures that each portion of the film shall be stopped for an instant before the opening, about 15 photographs per second can be received on the film, each representing the photographed group at a different instant from the others. In order to transform these negatives into positives, the negative film is rolled back on to the first drum, and on a second similar drum below it in the same compartment of the apparatus another film is rolled. The two films are then unrolled simultaneously, and thus the light entering through the objective and the aperture imprints on the new film a positive impression of the scenes represented on the other one. The positive film is made to wrap itself round the drum in the lower part of the apparatus, while the negative one is made to pass off through the bottom. The positive film is now wound back onto the first drum, and the instrument is then ready to project the representations on a screen at some distance. To do this, lantern accessories are necessary, but beyond that all that is required is to unwind the positive film by means of the same mechanism as performed the previous operations. The screen receives enlarged representations of the successive film-photographs in the same order as that of taking, and separated by such small intervals of time as to cause the whole to blend and form apparently a continuous representation of a moving group during a fairly long period of time. The advantages of this mode of photographing and throwing pictures on a screen over the older methods are obvious. Movements too rapid to be analyzed by the eye can, by controlling the rate of working while they are being represented on the screen, be made slow enough to permit of their true nature being observed; and, similarly, movements too slow for comprehension or rapid observation may often be, as it were, quickened.

CINERARY URNS — CINNAMON

Cinerary (sīn'ē-rā-rī) **Urns**, urns in which the ashes of the dead were deposited after the body was burned. Many Greek and Roman urns are in a high style of art, and are formed of bronze, marble, glass, or pottery ware. See BURIAL.

Cingalese. See SINGHALESE.

Cinna, sīn'ā, **Lucius Cornelius**, Roman patrician, associate of Marius, and leader of the popular party, during the absence of Sulla in the East. In 86 B.C. he was elected consul along with Octavius, and in violation of his oath to Sulla, he attempted to overpower the senate and to procure the recall of Marius and his party from banishment. In the contest which ensued, he was defeated by his colleague and driven from the city. His office thus became vacant, and the senate appointed another consul in his stead. He soon returned, however, along with Marius, and laid siege to Rome. The senate was forced to capitulate; but while the votes of the people were being taken for the repeal of the sentence against Marius, he broke into the city, massacred the friends of Sulla, and allowed his partisans to commit frightful excesses. He was consul for the next three years; but Sulla, having brought the Mithridatic war to a close, resolved (84 B.C.) to return to Italy to inflict condign punishment on his enemies. Cinna prepared to resist him by force of arms, but was prematurely slain by a mutiny among his own troops.

Cinnabar, sīn'nā-bār, red sulphide of mercury, HgS. The native cinnabar occurs in earthy, granular, and massive forms, and also in crystals belonging to the rhombohedral system. It is red, not infrequently with a brownish or leaden cast. Its hardness is from 2 to 2.5, and its specific gravity from 8.0 to 8.2. Artificial cinnabar, formed by subliming a mixture of sulphur and mercury, is brighter in color than the native mineral, probably on account of its greater purity, and is known in commerce as "vermilion." Cinnabar is the principal ore of mercury, and large deposits of it occur at Almaden, Spain, at Idria in Carniola, at New Almaden, Cal., and in certain parts of China and Japan. When it is roasted the sulphur burns away, and metallic mercury distils off and is condensed in earthenware vessels. (For a discussion of various ancient references to cinnabar, see 'Engineering and Mining Journal,' 16 May 1903, p. 747.)

Cinnamic (sīn'ā-mīk) **Acid**, an acid which exists in the free state in the balsams of tolu and Peru, in liquid storax, and in gum benzoin. When oil of cinnamon is exposed to the air it absorbs oxygen and deposits crystals of cinnamic acid, which are colorless, and readily soluble in alcohol, ether, and boiling water, but sparingly soluble in cold water. It is not of any importance in the arts and is chiefly interesting as being the acid corresponding to oil of cinnamon. This oil is the aldehyde of cinnamic acid, and is represented by the formula $C_9H_8O_2$. Though isomeric with oil of cassia it has a slightly different flavor, and is much more expensive. Both of these oils are employed in medicine as aromatic stimulants, but chiefly as pleasant adjuncts to disguise the taste of nauseous drugs. From a chemical point of view, the cinnamic acid and oil of cinnamon are related to benzoic

acid and oil of bitter almonds; and cinnamic acid may be converted into benzoic acid by oxidation.

Cinnamic acid is one of the active principles in many of the balsams and enjoys an excellent reputation in the treatment of tuberculosis and chronic ulcerative processes. It is a marked stimulant to the skin and mucous membranes, and has been very widely used in the form of an emulsion for the treatment of joint tuberculosis. Extravagant claims were made for it years ago, but these have been shown to be premature, although at the present time the drug is very widely used.

Cin'namon, the bark of the under branches of a species of laurel (*Cinnamomum zeylanicum*), which is chiefly found in Ceylon, but grows also in Malabar and other parts of the East Indies. The tree attains a height of 20 or 30 feet. Its leaves are oval, the flowers are of a pale yellow color, and the fruit is shaped somewhat like an acorn. There are two principal seasons of the year in which the Ceylonese bark the cinnamon-trees. The first of these commences in April, and the last in November; the former being that in which the great crop is obtained. In this operation the branches of three years' growth are cut down, and the outside pellicle of the bark is scraped away. The twigs are then ripped up lengthwise with a knife, and the bark is gradually loosened till it can be entirely taken off. It is then cut into slices, and on being exposed to the sun curls up in drying. The smaller pieces, or "quills," as they are called, are inserted into the larger ones, and these are afterward tied into bundles. Cinnamon is examined and arranged according to its quality by persons who, for this purpose, are obliged to taste and chew it. This is a very troublesome and disagreeable office, few persons being able to hold out more than two or three days successively. After this examination, the bundles are made up to a length of about four feet, and a weight of about 88 pounds each. From the roots of the trees numerous offsets shoot up. These, when they have attained the height of about 10 feet, are cut down and barked, being then about the thickness of a common walking-stick. The cinnamon which they yield is much finer than any other. In Ceylon the cinnamon-trees are said to be so common as to be used for fuel and other domestic purposes. The smell of cinnamon, particularly of the thinnest pieces, is delightfully fragrant, and its taste pungent and aromatic, with considerable sweetness and astringency. If infused in boiling water in a covered vessel it gives out much of its grateful flavor and forms an agreeable liquid. An oil is extracted from cinnamon, which is heavier than water. This is prepared in Ceylon, and almost wholly from the small and broken pieces. It is made, however, in such small quantity that the oil of cassia is generally substituted for it: indeed, the cassia bark is often substituted for cinnamon, to which it has some resemblance, although in its qualities it is much weaker. The leaves, the fruit and the root of the cinnamon plant all yield oil of considerable value. That from the fruit is highly fragrant, of thick consistence, and at Ceylon was formerly made into candles for the sole use of the king.

The oil of cinnamon consists mainly of cinnamic aldehyde, C_9H_8O , which, when pure, is

CINNAMON FERN — CINTRA

colorless. By exposure to air it absorbs oxygen and is converted into cinnamic acid (q.v.).

Various forms of cinnamon have been used for many years in medicine as flavoring agents and as carminatives. As cinnamon is rich in volatile oils, the action of the drug resembles the action of the oil of cinnamon, which is closely allied to other volatile oils (q.v.). The active principle in the oil is an aldehyde of cinnamic acid, and its antiseptic and antispasmodic action is due in large part to the cinnamic aldehyde.

Cinnamon Fern, a species (*O. cinnamomea*) of royal fern (*Osmunda*), so called from the cinnamon color of the sporanges. The plant has been known to reach the height of 11½ feet. It is frequent in boggy places during May and June in Florida and Mexico, and as far north as Minnesota and Nova Scotia. See OSMUNDA.

Cinnamon Oil, an essential oil distilled from cinnamon bark. It is of a bright yellow color, which gradually darkens. It consists chiefly of cinnamic aldehyde. When exposed to the air, it gradually absorbs oxygen and forms a resin and cinnamic acid.

Cinnamon-stone, or **Essonite**, a variety of grossularite garnet, usually of a beautiful cinnamon-brown, yellowish, or brownish-red color. It is a silicate of aluminum and calcium. Its name essonite is derived from the Greek *esson*, inferior, and refers to its hardness, 7, being inferior to that of hyacinth, which it often resembles. It occurs in isometric crystals, usually in rhombic dodecahedrons. Cinnamon-stone from Ceylon is the finest known, and has long been cut into gems. Beautiful specimens are also found at Piedmont, Ala., and Phippsburg, Me.

Cinnamomum, *sīn-a-mō'mūm*, a tropical genus of plants of the laurel family, natives of Asia and the Pacific islands. The genus numbers upward of 50 species, all possessing aromatic volatile oils, that make them valuable articles of commerce. Cinnamon proper is the prepared bark of *C. zeylanicum*; Culiwan bark comes from the *C. culiwan*, and cassia bark from *C. cassia*. The best-known American relative, although not of the same genus, is sassafras. See CASSIA; CINNAMON; LAURACEÆ.

Cino da Pistoia, *chē'nō da pēs-tō'yā*, Italian jurisconsult and poet: b. Pistoia 1270; d. there 24 Dec. 1336. He ranks among the best of the early Italian poets, and resembles Petrarcha more than any of the other predecessors of this poet. His poems were first published at Rome in 1558 by Pilli. They afterward appeared at Venice increased by a second volume, which, however, was not considered genuine. The most complete edition is that of Ciampi (1812). He published a commentary on the first nine books of the 'Codex Justinianus' in 1314.

Cinquefoil, *sīnk'foil*. 1. In botany, a species of the genus *Potentilla* of the Rose family, closely allied to the strawberry. There are upward of 150 species, chiefly natives of the temperate regions of the northern hemisphere, 60 of them occurring in North America, being found in Greenland, south to New Jersey, to northern Mexico, and in all the territory of the western and northwestern part of America to Alaska. In northern New England the shrubby

cinquefoil (*P. fruticosa*) is a troublesome weed. The name of the genus is from Latin *potens* (powerful), from the supposed powerful medicinal virtues of some of the species.

2. In architecture, an ornament in the Gothic style, consisting of five foliated divisions, often seen in circular windows. In heraldry, it means a five-petalled corolla borne without a stalk and full-faced.

Cinq-Mars, Henri Coiffier de Ruze, *ōn-rè kwā-fē-yā dè rü-zā sän-mär*, MARQUIS DE, French courtier: b. 1620; d. Lyons 12 Sept. 1642. At the age of 18 he was presented at court by Cardinal de Richelieu, and soon obtained the favor of Louis XIII., to whom he became master of the horse. Chafing at the restraint under which Richelieu held him, and ambitious of political power, he framed a conspiracy to overthrow the cardinal, of which the king himself, and his brother Gaston, Duke d'Orleans, were members. But Louis was weak and fickle, Gaston perfidious, and Richelieu not the man to be put down by a youth just turned of 20. Cinq-Mars was delivered up to the cardinal, and beheaded at Lyons with his friend, the councilor De Thou.

Cinq-Mars, a historical romance by Alfred de Vigny, published 1826. The subject is the conspiracy of Cinq-Mars and De Thou against Richelieu, its detection, and the execution of the offenders at Lyons in 1642. The work is modeled after the Waverley novels.

Cinque Pace, *sīnk-pās*, a kind of grave, stately dance, in which the steps were regulated by the number 5.

Cinque Ports, *sīnk-pōrts*, seven ports of England, on the coasts of Kent and Sussex—Dover, Sandwich, Hastings, Hythe, Romney, Winchelsea, and Rye. They were originally only five, the two latter having been declared ports subsequent to the first institution; hence the name *cinque*, five. The precise designation of these seven localities is "The Cinque Ports and the Two Ancient Towns," the last named being Winchelsea and Rye. They were granted special privileges by the later Saxon and earlier Norman kings, on condition of providing a certain number of ships during war, there being no permanent English navy previous to the reign of Henry VII. The ports are, collectively, in the jurisdiction of a lord warden, whose office, though the salary is £3,000 a year, is little more than a sinecure. See Burrows, 'The Cinque Ports' in Historic Towns series.

Cinquecento, *chīng-kwē-chēn'tō*, in Italian, 500, an abbreviation for *mille cinquecento*, or 1,500. The term is used to designate the art styles of the 16th century, or such as were developed about, or after, 1500. In like manner the terms *trecento* and *quattrocento* denote art of the 14th and 15th centuries. The Cinquecento is the period of the highest perfection of the arts of the Revival or Renaissance.

Cintra, *sēn'trā*, Portugal, a town in the province Estremadura, 15 miles northwest of Lisbon, on the slope of the Sierra de Cintra. The country around is extremely beautiful, and the climate mild and agreeable. On these accounts it is much resorted to by the wealthier inhabitants of Lisbon, who have here their *quintas* or country houses. The kings of Portugal have a palace at Cintra, with fine gardens

ornamented with fountains. Cintra is celebrated for the convention entered into there in 1808, by which the French, after their defeat at Vimera, were not only permitted to leave Portugal, but were conveyed to France with their arms, artillery, and property. Pop. 4,846.

Cinura, sī-nū'ra, a name proposed by Packard for a subdivision of the *Synaptera* under *Thysanura*. It includes the bristle-tails (q.v.) See Packard, 'Entomology for Beginners.'

Ciotat, sē-ō-tā, La, France, a seaport, department of Bouches-du-Rhône, on the Mediterranean, 15 miles southeast of Marseilles. It has a safe and commodious harbor, and carries on a considerable trade in the productions of the district. The yards and workshops of the Messageries Maritimes Company employ about 3,000 hands. The town, surrounded by its old ramparts, consists of well-built houses and spacious well-paved streets. The surrounding district yields wine, oil, oranges, etc. Pop. 11,300.

Cipher, a kind of monogram, in which the initials of a person or persons are intertwined with each other.

Cipher Despatches. On the meeting of Congress in December 1876, owing to the disputed presidential election returns, each chamber instituted an inquiry into the alleged frauds; the Senate (Republican) through its committee on privileges and elections; the House (Democratic) by a select committee on Louisiana affairs, popularly known as the Morrison Committee, from its chairman, William R. Morrison (q.v.). Each committee subpoenaed the Western Union Telegraph Company for the political despatches of that period in its possession; and portions of these, which the company had gathered from its various offices and forwarded to New York, were sent to each. A large number of these were in cipher; their political nature being inferred from the names and locations of senders and addressees. The Senate, though calling for telegrams from all portions of the country, devoted themselves mainly to Oregon where, it was alleged, from the translation of Democratic cipher telegrams, \$8,000 had been devoted to securing the legislature's recognition of a Tilden elector. (These telegrams and translations were published in Senate Miscellaneous Document No. 44, 44th Congress, 2d session.) These despatches, after the investigation closed, were ostensibly returned to the Western Union; those from the Morrison Committee apparently were all returned. But the cipher despatches before the Senate committee were sorted over and the Republican ones nearly all destroyed (by Senator O. P. Morton, as said); while certain packages of the Democratic ones were preserved (by the same hands), and came into possession of Thomas J. Brady, the second assistant postmaster-general, William E. Chandler, afterward secretary of the navy, then lawyer and political manager, and Frank Hiscock, representative from New York. By these, in the summer of 1878, they were sent to White-law Reid, editor of the *New York Tribune*, who published them serially, including the cipher despatches and professed translations. These were made by John R. G. Hassard and Col. William M. Grosvenor, of the *Tribune* staff, partly on suggestions of Prof. E. S. Holden of Washington; involved the use of several

different ciphers, and different applications of the same cipher; and left some words illegible. As printed, they referred to offers of the disreputable "returning boards," then supreme in South Carolina and Florida, to sell their vote to Tilden for large sums in cash, \$80,000 to \$200,000; and negotiations of Democratic managers with them, closed by Tilden's refusal to make the bargain, and the transfer of the votes to Hayes. Tilden himself denied all knowledge of the telegrams or their subject matter, and the managers denied the accuracy of the translations. Their moral defense in the public mind was that they were submitting to blackmail to obtain what they believed legally and equitably theirs already, and that the Republican telegrams, if published, would have left that party in no better case. On 21 Jan. 1879 the new House appointed a "select committee on the alleged frauds in the election of 1876," avowedly to investigate the cipher despatches. It received from Benjamin F. Butler of Massachusetts another package of the telegrams, partly unpublished, given him by Mr. Chandler, and took a mass of testimony—published in House Miscellaneous Documents, 45th Congress, 3d session, Vol. V., with the telegrams and the translations, except those already published in the Senate document above cited.

Ciphers, signs for numbers (see NOTATION). They are either borrowed signs, as letters, with which the Greeks and several tribes of the north of Europe designated their numbers; or peculiar characters, as the modern or Arabic ones. The ciphers, such as they are at present, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, did not attain their present character till a pretty late period. We have them from the Arabians, who derived them from Hindustan. It seems probable that the Egyptians were acquainted with the present system of ciphers, at least in its principles. As early as the 9th century ciphers were used, though seldom, in France. Not until the 11th century did their use become common in Europe.

Cipher Writing, a method of sending important intelligence in a manner so effectually disguised that only those for whom the news is intended can understand the meaning of what is written. Till comparatively recent years diplomats, statesmen, and military or naval commanders were the principal persons compelled by circumstances to keep their affairs or their intended movements shrouded in secrecy. So long as there was not regular postal service important letters were sent by courier, and thus the weightiest secrets were often at the mercy of any one inclined to be dishonest. Before the spread of education, and at a time when few possessed a knowledge of any other language than their own, to indite a letter or despatch in a foreign tongue was usually ample protection against a surreptitious prying into its contents. But it is now many years since this safeguard was broken down, and it became necessary for all who did not want their correspondence known to interested parties to contrive some means of communicating with the pen that would defy scrutiny.

Hence there came into extensive use the art of writing in cipher, called also cryptography, from the Greek words *κρυπτός*, "secret," and *γράφειν*, "to write." Under this term are in-

CIPPUS — CIRCARS

cluded all private alphabets or systems of characters for the safe transmission of secrets. As fast as one device was discovered human ingenuity contrived another still more intricate. A cipher sufficiently perplexing for all ordinary purposes is found by using the alphabet in any language in an inverted order, taking Z for A, Y for B, X for C, and so on. When it is only desired to write a cryptogram, and not print it, such other characters may be used as are mutually agreed upon by correspondents, or the alphabet may be transposed in other ways. A figured cipher is one in which the letters of the alphabet are numbered, and these numbers compose the cryptogram. To insure secrecy it is, of course, necessary that the particular series of numbers chosen shall be known only to those who use the cipher. Another plan consists in choosing a certain book—a dictionary appears to have been the favorite—and by a simple citation of the number of the page, of the column, and of the line, sentences were constructed, the key to which was extremely difficult of discovery by one not in the secret.

As the number of different dictionaries was necessarily limited, however, the mystery could usually be solved by any one willing to devote time and patience to hunting up the particular one adopted. Various other books have been similarly used, such as spelling-books, and even the Bible; but these systems were cumbersome, and were all more or less open to detection. From a few rules, as for instance, that in English *e* is the letter which most frequently occurs, and *the* the most common word, the whole might generally be deduced. The task of detecting cipher methods is rendered much more difficult when false characters, which are not to be counted, have been interspersed throughout the cipher. A curious explanation of the process of unraveling a cipher is given in Poe's story of the 'Gold-Bug.' Still, with devices such as these, more or less ingenious, the world was fain to be content until about 40 years ago, when a scientific discovery was made that indirectly converted cryptography into a recognized calling, requiring thought, labor, and inventive ability.

The opening years of the second half of the 19th century found the world in amazement over the then recent invention of telegraphy. Immediately a new want made itself felt. Secrecy had been sacrificed at the shrine of speed. If the mail was slow, it afforded privacy, but the contents of a telegraphic message are of necessity known to others besides the sender and the receiver. So the minister, the banker, and the merchant soon began to send cipher despatches. It was quickly discovered, however, that existing methods of cipher writing were unadapted to telegraphy; the costliness of the new invention necessitated brevity; and thus it was not long before there went whirling over the wire messages of 10 words that, properly deciphered, included from 30 to 50.

A great proportion of commercial messages—orders to buy and sell and the like—are similar in their terms, and hence it is that a single word representing three or four words in frequent use is the plan on which our present cable ciphers are based, whereby there is annually a large saving in expense. Then, too, as trade increased and competition became fierce, every firm wanted its own cipher system, dis-

tinct from any used by other houses in the same business; and reflection will enable us to appreciate the vast number of separate ciphers in use in a great commercial centre like New York. Therefore, in course of time, the preparation of cipher systems for merchants and others using the telegraph largely came to be a regular calling, and in every large city the sign "Cable Codes" is to be seen.

At one of these offices a person may be accommodated with a code of from 50 to 5,000 words. Most of these codes are alphabetically arranged in parallel columns, like shipping signals—the English words and phrases in one column, and their cipher equivalents in another. To such magnitude has this business grown that all languages are ransacked for suitable cryptographic codes, and every day sees their preparation growing more complicated and costly. The modern telegraphic signals and our various systems of short-hand may be called examples of cipher writing, though in these cases, of course, speed and brevity are aimed at, not secrecy.

The cipher codes of the State Department at Washington are frequently changed. The special code is entrusted to the personal custody of diplomatic officials embarking on a mission, who retain possession of it and destroy it if their lives are endangered. The imprisonment of the United States Minister Conger, in Peking, in 1900, caused the cipher to figure conspicuously in international relations. China objected to the transmission of cipher despatches, but subsequently withdrew her objection. She was accused of having obtained surreptitious possession of a copy of the United States cipher code.

Cippus, sip'ūs, a low column generally rectangular and sculptured, and often bearing an inscription, used by the Romans for various purposes. Cippi served as sepulchral monuments, as milestones and boundaries, and in some cases to receive the inscribed decrees of the senate. They were frequently or usually adorned with rams' heads supporting festoons of flowers, figures of sphinxes, and various mythological subjects. Those serving as tombstones bore the epitaph of the deceased, including his name, the date of his birth, death, etc.

Cipriani, Giambattista, jām-bāt-tēs'tä chē-pre-ä'nē, Italian painter and engraver: b. Pistoia 1732; d. London 1785. He was one of the first Fellows of the Royal Academy. His drawing is correct, his heads have grace and loveliness, his coloring is harmonious, and the general impression of his composition good. Many fine engravings of Bartolozzi are from the designs of Cipriani.

Circars, sēr-kärz', **The Five Northern**, an ancient division of the Madras presidency, on the east coast of Hindustan. The northern Circars were formerly Chicacole, Rajahmundry, Ellore, Condapilly, and Guntur; but the districts that now correspond most nearly with them are those of Ganjam, Vizagapatam, Godavari, and part of Krishna. They were among the earliest of the territorial possessions of the East India Company, which acquired four of them in 1765, from Mogul Shah Allum, who bestowed them on the company as a free gift.

CIRCASSIA

The fifth, Guntur, came into the possession of Great Britain in 1788.

Circassia, *sir-kāsh'ī-a*, a region in the southeast of European Russia, lying chiefly on the north slope of the Caucasus, partly also on the south, and bounded on the west by the Black Sea. It forms part of the government of the Caucasus, including a great portion of the territory of the Kuban and the districts of Sukhum and Tchernomore, but is not itself an official division; and, indeed, the name is now much less seldom heard than formerly, since the country has been entirely incorporated with the rest of the Russian possessions in this quarter, and has no longer a separate political existence. The whole region is mountainous, and is composed of the northern masses or western offshoots of the great chain of the Caucasus, the culminating heights of which are those of Mount Elbruz. The mountains are intersected everywhere with precipitous ravines, in the deepest hollows of which flow rock-impeded streams that occasionally become raging torrents. The chief rivers are tributaries of the Kuban and the Terek, the first of which bounds the territory on the northeast and east sides, while the Terek skirts the Circassian limits on the southeast side. Circassia is a beautiful, though rugged, country. The sides of the mountains are often clothed with thick forests. Its climate is temperate, its inhabitants healthy and long-lived. There are few manufactures and little trade.

When Russia took possession of this region the exodus of the inhabitants left but comparatively few Circassians proper, and those who remained have now to a large extent lost their national peculiarities. The people call themselves Adighé; the Tartar word *Tchertkess* being a slanderous name applied to them as "robbers." The Circassians were divided into several tribes, having three distinct languages, or more. Each tribe included five ranks of men, namely, princes or chiefs (*pshat*); nobles (*vork*); middle class (*thlofokl* or *tokavs*); serfs, or retainers of the nobles; and slaves—the latter being prisoners taken in war, or the descendants of such. All classes except the slaves were united into fraternities, for mutual support; and this union formed the real groundwork of the government of the country, which was altogether peculiar, being patriarchal in nature, with a great amount of freedom. Hereditary feud, once prevalent, was latterly almost extirpated, and pecuniary compensation, including a mulct upon manslaughter for the benefit of the deceased's fraternity, was substituted. Crimes of all degrees, and civil causes, were judged either in general or local councils; and petty offenses by district judges and assessors.

The religion of the country was chiefly Moslem; but in many cases it formed a jumble of Christian, Jewish, and heathen traditions and ceremonies. In no case was it very strict; although most of the chief Mohammedan feasts and fasts were pretty well observed. The morals of the people were nevertheless respectable. Great crimes were rare; and such as have their source in poverty with one class, and avarice in the other, were not common, for property was little coveted, and money was scarcely known. The commerce of presents was universal; few or none were very rich, and

there were no miserably poor at all. There was no tenure of land in Circassia except what immediate possession, for the purposes of cultivation, gives.

Agriculture here is still in a rude state, but the produce of the tilled lands is considerable, and exceeds local wants. The forests yield great quantities of fine wood, including, oak, and all our own best species of timber trees, with (in the southern regions) boxwood, etc. The chief grain is millet; but barley, oats, and a little wheat are also raised. There are great numbers of goats, sheep, and oxen.

The Circassians, male and female, are a well-formed and handsome race. The males are highly prized as warriors by the Russians, and the females as mistresses by the Turks, a position generally envied by the women themselves. The men are among the finest equestrians in the world; and their horses, though small, are of good make, hardy, and intelligent.

The early history of the Circassians is obscure. They have no annals; but their minstrels, in their martial and genealogical strains, preserve traditional accounts of the deeds and lineage of their dead heroes and existing tribes. Between the 10th and 13th centuries this country formed a portion of the empire of Georgia, and it is said the Georgian queen Tamar subjected and for a time Christianized them. During the Middle Ages the Genoese had several trading stations on the coast, of which some memorials yet exist. In 1424 the Circassians were an independent people, and at war with the Tartars of the Crimea, etc., to whose khans, however, it is understood some were occasionally tributary. In 1555 the Muscovite czar, Ivan Vasilievitch, came to their aid against the Tartars, and married a Circassian princess. But the stay of the Russian forces was short, and after their withdrawal the belligerents kept up a struggle with varying results till 1705, when the Tartars were finally defeated in a decisive battle. Shortly after the territorial encroachments of Russia on the Caucasian regions began. From that time she advanced by steps slow and stealthy, and in 1781 obtained a frontier line on the right bank of the Kuban, the left banks of which formed the national limit of Circassia. In 1784 the Turks founded Anapa, near the northeast corner of the Black Sea, as a place of trade for their commerce and that of the Circassians; this was the only territorial settlement they as yet had in or near the country, and the place was a mere factory. In 1807 the Russians took Anapa from the Turks; but in terms of the Treaty of Bucharest, in 1812, it was restored. In 1829 it was once more taken by the Russians, and finally ceded to them by the Treaty of Adrianople, along with the whole of Circassia—as they interpreted the words of that cunningly ambiguous document; the fact being that not an inch of the territory of Circassia proper had ever been in the possession of either Turks or Russians. Many of the Circassians were, indeed, Mussulmans, and all such recognized the padisha (sultan) as their spiritual head, but nothing more. As the "hated Muscovites" (*fana Moscov*) immediately proceeded to act upon the pretended cession, a struggle commenced which was continued over a long series of years. The spirit of resistance to Russia became stronger than ever; and a bold leader, Schamyl, who united

CIRCE — CIRCLE OF CURVATURE

in his person the imputed sanctity of the hierarch with the daring courage and prudent conduct of a great warrior, with his heroic band beat off or baffled the whole disciplined forces that Russia was able to send against him. But at length the protracted resistance of the people terminated in the triumph of the more powerful of the two foes, and the Circassians with their leader surrendered. Large numbers of them, as many it is said as 500,000, were deported into the Turkish provinces in 1864, and were settled both in Asia Minor and in Bulgaria and Servia. A considerable portion of their former country was thus almost denuded of inhabitants.

Circe, sēr'sē, in classical mythology, a sorceress on the island of Aea. Ulysses in his wanderings landed on her island, and sent out Eurylochus with a party to explore the country. They arrived at the palace of Circe, who gave them food and wine, and with her magic wand changed them into swine. Eurylochus only, by cautiously abstaining from the magical potion, escaped the transformation, and informed Ulysses of the event. He immediately proceeded himself into the country to free his companions. On the way Hermes (Mercury) met and advised him. Following the advice of Hermes he then ran upon her with his drawn sword, threatening her with death, and compelled her to bind herself by an oath to do him no injury, and deliver his companions. Ulysses then remained with her a whole year. Before his departure she told him that in order to secure a safe return to his country he must visit the infernal regions and ask advice of Tiresias. This he did, and again visited Circe on his way back.

Circinus, sēr'sī-nūs ("the Pair of Compasses"), one of the 14 southern constellations added to the heavens by Lacaille in connection with his work at the Cape of Good Hope in 1751-2. It is surrounded by Apus, Musca, Centaurus, Lupus, Norma, and Triangulum Australe.

Circle, in geometry, a plane figure contained by one line, which is called the "circumference" and is such that all straight lines drawn from a certain point (the "centre") within the figure to the circumference are equal to one another. According to this definition of Euclid, which is remarkable for its perspicuity and precision, the circle is the space enclosed, while the circumference is the line that bounds it. The circumference is, however, frequently called the circle. Still no confusion ever arises from this usage.

The properties of the circle are investigated in books on geometry and trigonometry. Properly the curve belongs to the class of conic sections, and is a curve of the second order.

The celebrated problem of "squaring the circle" has given rise to extraordinary geometrical labors, and even now there are to be found, as in the case of the problem of perpetual motion, those who profess to have solved it. The question is to find a square whose area shall be equal to the area of a circle. It is not possible to do so. All that can be done is to express approximately the ratio of the length of the circumference of the circle to the diameter, and to deduce the area of the figure from this approximation. This ratio has, however, been determined to a degree of exactness

more than sufficient for all practical purposes. If the diameter be called unity, the length of the circumference of the circle is 3.1415926535...; and the area of the circle is found by multiplying this number by the square of the radius. Thus the area of a circle of 2 feet radius is 3.14159×4 , or 12.56636 square feet, approximately.

For trigonometrical calculations the whole circumference of the circle is divided into 360 equal parts or arcs, called degrees; each degree is divided into 60 minutes, and each minute into 60 seconds. The angles subtended at the centre by these arcs are called respectively degrees, minutes, and seconds of angle.

In practical astronomy, metallic circles accurately divided are used to measure angles. The general principle is to have a telescope moving in a given plane, while a divided circle, situated in a parallel plane, measures the angle through which the telescope moves. Verniers or microscopes are used to read the graduated circle with great precision.

The term "meridian circle" is applied to an instrument in which the telescope revolves in the plane of the meridian, and a divided circle measures angles in this plane.

In logic, a circle is the fault of an argument that assumes the principle it should prove, and afterward proves the principle by the thing which it seemed to have proved. The same fault takes place in definitions when an idea is defined by others which suppose the knowledge of the first. Arguing in a circle is a fault into which men are very liable to fall, particularly in theological discussions.

In astronomy, the heavens being considered as a spherical surface drawn round the earth as centre, an imaginary line drawn round the heavens so as to lie in one plane is a circle of the sphere. It is a "great circle" if the plane of it passes through the centre; thus the celestial equator and the ecliptic are great circles; if the plane of the circle does not pass through the centre it is called a "small circle"; all parallels of declination are small circles.

Circle of Curvature. When a point in motion is tracing out any curved path, the direction of motion changes from point to point of the curve, and the path is said to be more or less curved according as the direction of the motion of the point changes more or less rapidly. The curvature at any point is measured by the rate of this change at the point per unit length of the curve.

In the case of the circle the curvature is the same at every point; and it is easy to show that the curvature measured as above is equal to the reciprocal of the radius of the circle.

If we consider any small portion of any curve whatever, it may be approximately taken as an arc of a circle, the approximation being closer and closer to the truth as the portion considered is smaller and smaller, and by taking it small enough we may make the approximation as close as we please. The curvature is then the reciprocal of the radius of this circle.

The circle which coincides more nearly than any other with an infinitely small arc at any point of any given curve is generally found by means of the methods of the differential calculus. Such a circle is called the circle of curva-

CIRCLE — CIRCULAR POLARIZATION OF LIGHT

ture, and sometimes the osculating circle. The radius of it is called the radius of curvature of the curve at the point considered; and the centre of this circle is called the centre of curvature.

Circle, Magic, a space in which sorcerers were wont to protect themselves from the fury of the evil spirits they had raised. This circle was usually formed on a piece of ground about nine feet square (in the East seven feet appears to have been considered sufficient), in the midst of some dark forest, churchyard, vault, or other lonely and dismal spot. It was described at midnight in certain conditions of the moon and weather. Inside the outer circle was another somewhat less, in the centre of which the sorcerer had his seat. The spaces between the circles, as well as between the parallel lines which enclosed the larger one, were filled with all the holy names of God, and a variety of other characters supposed to be potent against the powers of evil. Without the protection of this circle, the magician, it was believed, would have been carried off by spirits. Another figure which, described upon the ground, could bar the passage of a demon, was the pentagram.

Cir'cleville, Ohio, a city and county-seat of Pickaway County, on the Scioto River, the Ohio Canal, and the Cincinnati & M. V. and the Norfolk & W. R.R.'s, 28 miles south of Columbus. It derives its name from a circular earthwork built by some ancient people, and which is the site of the present city. It has numerous churches, several daily and weekly newspapers, three banks, and manufactures flour and meal; agricultural implements, furniture, canned goods, etc., and a large pork-packing industry. Pop. (1900) 6,991.

Circuit Court. See COURTS.

Circular Motion. A body in motion, which is continually impelled by some power toward a fixed point out of its original direction, is obliged to describe a curvilinear path round this point. A stone slung round by a string moves in a circle, because it is drawn toward the hand in every point of its path. The moon moves in a circle round the earth, because it gravitates toward the earth, and is thus drawn from the rectilinear direction which it would otherwise pursue. In such cases the point to which the body constantly tends is called the centre of the forces; the force itself, by which it is impelled, is called the centripetal force; that by which it strives to fly from the centre is called the centrifugal force; and the motion which is produced by these two forces, the circular motion. All the planets in the solar system are carried round the sun, and the satellites round their planets, by these forces. (See CENTRAL FORCES.) The theory of circular motion is a subject of celestial mechanics, on which Newton composed his 'Philosophiæ Naturalis Principia Mathematica'; and Laplace, his 'Mecanique Celeste,' etc.

Cir'cular Notes, in commerce, notes or letters of credit furnished by bankers to persons about to travel abroad. Along with the notes the traveler receives a "letter of indication" bearing the names of certain foreign bankers who will cash such notes on presentation, in which letter the traveler must write his name. On presentation the foreign banker can de-

mand to see the letter of indication, and by causing the presenter to write his name, can compare the signature thus made with that in the letter, and so far satisfy himself as to the identity of the person presenting the note.

Circular Numbers, numbers whose powers end on the same figure as they do themselves: such are numbers ending in 0, 1, 5, 6.

Circular Parts, Napier's Rule for, a rule invented by Baron Napier of Merchiston, near Edinburgh, for the solution of all cases of right-angled spherical triangles, eminent for its comprehensiveness and utility in extensive surveys, navigation and practical astronomy. See TRIGONOMETRY.

Circular Polarization of Light. Plane-polarized light is altered into circularly polarized light by passing in a particular direction through a Fresnel's rhomb. This is a parallelepiped of glass with its faces set at certain angles depending on the refractive power of the glass. The light entering one base of the rhomb is twice internally reflected before it emerges at the opposite base; and while common unpolarized light passes through the rhomb without suffering alteration plane-polarized light has its properties in general completely altered. The final result depends on the inclination of the plane of polarization of the incident light to the plane of the internal reflections. In two cases, namely, when this angle is 0° or 90° , the emerging light is still plane polarized; when the angle is 45° the light is circularly polarized; in every other case it is elliptically polarized. In the first case, as will be understood from consulting the article on POLARIZATION OF LIGHT, the analyzer, on being applied to test the beam, shows in one position bright light, and on being turned round the principal axis through 90° , total darkness. In the last case—that of elliptic polarization—the analyzer shows, on being turned round, a beam of varying intensity, but never complete extinction. In the case of circularly polarized light the analyzer, on being turned round, shows a beam of the same intensity in every position of the analyzer, and, in fact, does not at first sight differ from ordinary unpolarized light. When, however, it is examined—not with a Nichol's prism direct, but after a second Fresnel's rhomb has been interposed—it is found to differ very remarkably from unpolarized light. The latter is, as we have remarked, unaffected by the rhomb; the circularly polarized light emerges from the second rhomb plane polarized. It is thus shown how to produce and how to recognize circularly polarized light. We now give a few of its most remarkable properties.

The light as we have said, that emerges from the second Fresnel's rhomb is again plane polarized, but it does not emerge precisely as it entered. For, except in one particular position of the two Fresnel's rhombs, the light that emerges from the second rhomb has its plane of polarization changed; the plane is turned round, in fact, through an angle depending on the positions of the two rhombs with regard to the original plane of polarization; and it may be turned round either in a right-handed direction, as it is called (see below), or in a left-handed direction. We might arrange a set of pairs of Fresnel's rhombs, it is evident, in such positions that each pair should give the plane of polariza-

CIRCULAR SAILING — CIRCULATION

tion of the ray passing through it a farther twist in the same direction, and we might turn it thus through any angle whatever. Such a power as we have imagined in a set of Fresnel's rhombs is possessed by quartz and by a considerable number of solutions of organic bodies, and it is known as a power of rotating the plane of polarization. When a beam of homogeneous light has passed through the polarizer, and the analyzer is placed in the position of total extinction of the ray (see POLARIZATION OF LIGHT), on introducing a plate of quartz the light reappears; but on turning the analyzer round, either in a right-handed direction or in a left-handed direction (whence the names), extinction is again obtained. Quartz is named right-handed quartz or left-handed quartz according to the direction in which the analyzer must be turned. The amount of the angle through which it must be turned depends on the thickness of the plate of quartz.

If, instead of using homogeneous light, as we have been supposing, plane-polarized white light is employed, it is found that the different rays are differently deviated. The effect on the more refrangible rays is greater than on the less refrangible, and the plane of polarization of the blue rays will thus be turned through a greater angle than that of the red rays. It will be perceived from this, that having arranged the polarizer and analyzer, and inserted a plate of quartz, as described above, on rotating the analyzer in the direction, right-handed or left-handed, that corresponds to the nature of the plate of quartz, we shall not arrive at a position of total extinction, but we shall see a most beautiful play of colors changing in order from red to yellow, then to orange, green, and blue. These phenomena are among the most beautiful and most striking of all the marvelous phenomena of light.

It has been remarked above that certain organic liquids and solutions have this rotatory power. Among these may be mentioned turpentine, some essential oils, solutions of sugar, and solutions of tartaric acid. This fact is taken advantage of in Soleil's saccharometer (q.v.), an instrument for determining the value of cane-sugar in a liquid.

We have spoken above of the right-handed and left-handed properties of quartz; a discovery of Haüy leads us here to the very threshold of the molecular structure of crystals. We may yet hope for discoveries in this direction. On comparing crystals of quartz that give us right-handed and left-handed polarization, it is found that a very remarkable property connects their forms. The crystals that give right-handed and left-handed polarization are of an unsymmetrical construction, such that either viewed in a looking-glass gives an image of the same form as the other. Pasteur, examining the crystals of the two varieties of tartaric acid whose solutions have opposite rotational powers, but whose chemical properties are very nearly the same, showed that the same law holds for them; and, having crystallized what is known as neutral tartaric acid, was able, by picking out the crystals by hand, to separate it into equal portions of lævo tartaric acid and dextro tartaric acid. But we must refer the reader to the special articles on the chemistry of this substance.

One of Faraday's most brilliant discoveries was the rotatory power of glass under the action of a powerful magnet. The reader is referred for an account of it to the article POLARIZED LIGHT.

Cir'culating Library. See LIBRARIES.

Circulating Medium. See MONEY.

Circulation, in animals, the passage of blood in circuit through the body; in vegetables, a similar circuit of sap.

Circulation of the Blood.—This process is widely distributed throughout the animal kingdom, even the irregular movement of blood in the lowest animals being termed a circulation. Properly speaking, however, only fishes, birds, and mammals may be said to have a distinct circulation. In the lower animals, such as the lobster or crab, there is no continuous vascular system, the arteries ending in lymph spaces. In birds and mammals, however, a particle of blood starting at any given point in the system makes a complete circuit and repasses its point of starting.

History.—In the chapter on anatomy the point was reached where the important discoveries of Harvey had revealed the secret of the circulation and that the study of human physiology was set on a secure basis, but in the matter of the circulation all the credit of discovery is not due to Harvey alone. It will be recalled that the authority of Galen persisted for over 1,000 years, and that the opening of the 16th century found a number of enthusiastic anatomists who founded a school of their own, and the new Vesalian anatomy replaced the old Galenic anatomy, but unfortunately not Galen's physiology. The old doctrine of Galen as applied to the circulation may be summed up as follows (Foster, 'History of Physiology'):

"The parts of the food absorbed from the alimentary canal are carried by the portal vein to the liver, and by the influence of that great organ are converted into blood. The blood thus enriched by the food is by the same great organ endued with the nutritive properties summed up in the phrase 'natural spirits.' But blood thus endowed with natural spirits is still crude blood, unfitted for the higher purposes of the blood in the body. Carried from the liver by the vena cava to the right side of the heart, some of it passes from the right ventricle through innumerable invisible pores in the septum to the left ventricle. As the heart expands it draws from the lungs, through the vein-like artery (or, as we now call it, the pulmonary vein), air into the left ventricle. And in that left cavity the blood which has come through the septum is mixed with the air thus drawn in, and by the help of that heat which is innate in the heart, which was placed there as the source of the heat of the body by God in the beginning of life, and which remains there until death, is imbued with further qualities, is laden with vital spirits and so fitted for its higher duties. The air thus drawn into the left heart by the pulmonary vein, at the same time tempers the innate heat of the heart and prevents it from becoming excessive. Thus from the right side of the heart there is sent to the body generally along the great veins, and to the lungs along the artery-like vein (the pulmonary artery), a flow, followed by an ebb, of crude blood endued with natural spirits only, blood serving the lower stages of nutrition. Blood flows through the artery-like vein to the lungs for the nourishment of the lungs, just as it flows through the other veins for the nourishment of the rest of the body; in both cases there is an ebb as well as a flow along the same channel. From the left side, on the other hand, there takes place along the arteries to all parts of the body a flow, followed also by an ebb, of blood endued with vital spirits, and so capable of giving power to the several tissues to exercise their vital functions. As this blood passes from the left heart along the vein-like artery to the lungs, it carries with it the various fuliginous vapors which, in the fermenting activity giving rise to the vital spirits, have been extracted from the crude blood,

CIRCULATION

and discharges these vapors into the pulmonary passages. Arterial blood, that is, blood laden with vital spirits, reaching the brain, there generates the animal spirits, which, pure and unmixed with blood, existing apart from blood, are carried along the nerves to bring about movements and to carry on the higher functions of the body."

This is the outline of the crude Galenic doctrine, and Vesalius, brilliant anatomist that he was, was content to accept it, although there are evidences that he was very skeptical regarding much of Galen's physiological teaching. It was particularly from the anatomical side that he was most skeptical; namely, the lack of tangible holes between the two sides of the heart, which were so important to the Galenists. His skepticism was taken up by his pupils, and was also felt by others, one of them, Michael Servetus, who published a remarkable book, the 'Restitutio Christianismi,' in which a much truer conception of the circulation of the blood was taught. This was as early as 1553. He rejected entirely the ancient doctrines, and had grasped the true doctrine of the pulmonary circulation, the passage of the blood from the right side through the lungs to the left side. Servetus, however, was a theologian more than a physician, and his early death probably prevented his further studies. Realdus Columbus, of Cremona, must be regarded as another link in the chain that led up to the final solution. He is thought to have been a tricky man, however, and one who would not hesitate to poach on another's preserves, and there are indications of his copying much from Vesalius' works and claiming them as his own. He was vain and ignorant, but in his book, 'De Re Anatomica' (1559), he described correctly the pulmonary circulation, but he was unable to draw from it the lessons that it implied. This, by many historians, is taken as evidence that he was only a copier, and that probably the work of Servetus had been seen by him and he had claimed the discovery as his own. Cæsalpinus, a noted botanist, was the first to appreciate the fact that at the contraction of the ventricles (systole) the blood was thrown into the aorta and into the pulmonary artery, and at its diastole it received the blood from the vena cava and the pulmonary vein. He also seemed to have grasped the fact of the flow of the blood from the arteries to the veins, and of the flow along the veins to the heart. This was in 1571 and 1593. Thus Cæsalpinus had a true suggestion of the idea both of the pulmonary and systemic circulations. But Cæsalpinus' work seems to have been lost sight of, and another, Hieronymus Fabricius, had the honor to open the next door that led to Harvey's triumph. Fabricius called renewed attention to the valves in the veins, but missed their real function, and, although he was Harvey's teacher, he was more of a Galenist than a modern.

It is to William Harvey's credit, not so much that he was the discoverer of the physiology of circulation,—this, it can be seen from this brief recital, was of gradual accretion,—but that he was the first demonstrator of the process. He was the first physiological experimenter, and his work on the living animal has opened up to the world most of its priceless gifts in the field of medicine. It was by the faithful and prolonged study of many hearts of many animals that showed him that —

"the motion of the heart consists in a certain universal tension, both of contraction in the line of its

fibres, and constriction in every sense, that when the heart contracts it is emptied, that the motion which is in general regarded as the diastole of the heart is in truth its systole";

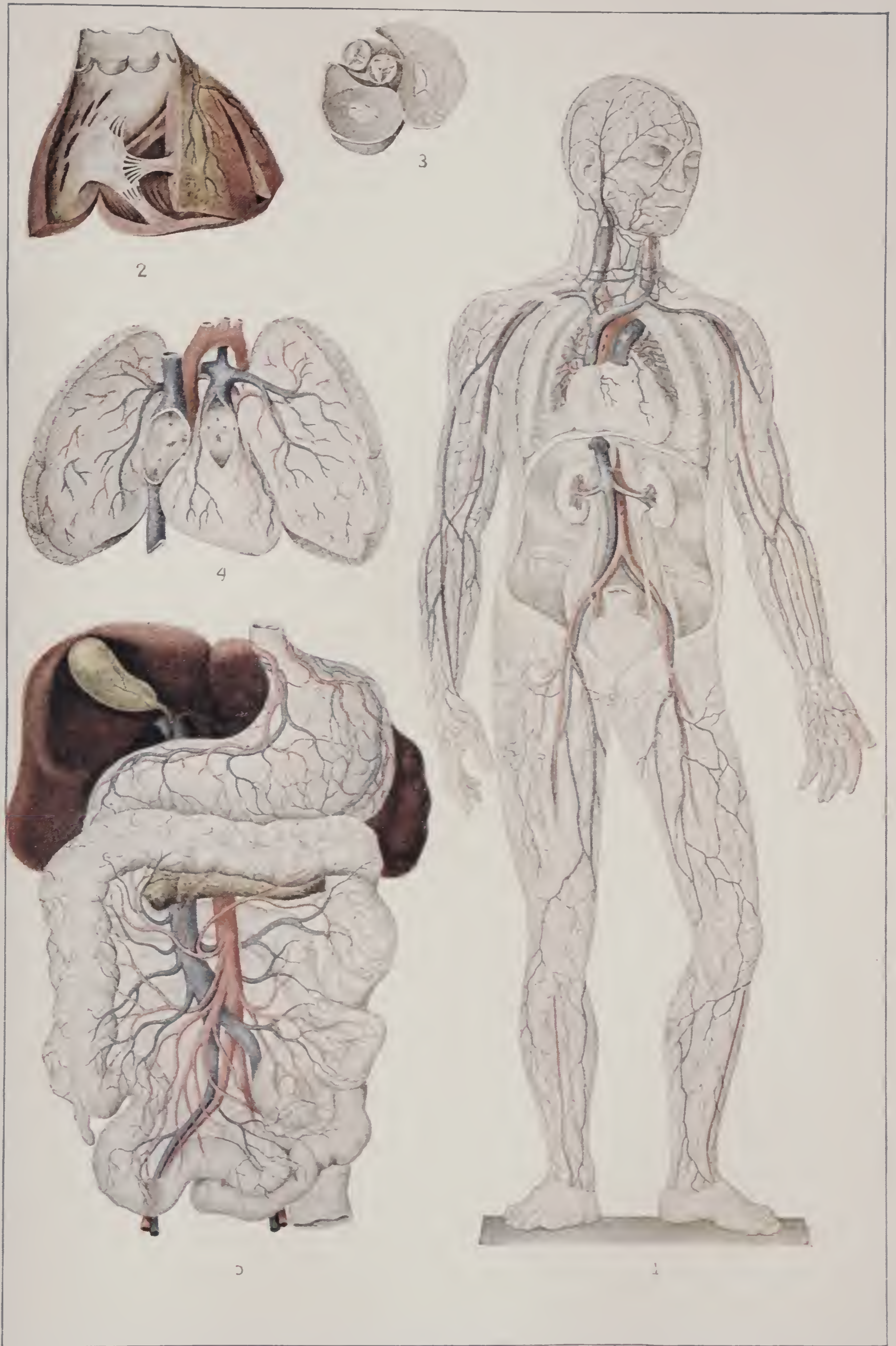
—that the true work of the heart is not that it sucked blood in, but that it drove blood out. Cæsalpinus guessed at this, or may be knew it, but Harvey proved it, and, what is more, read the consequences. He saw clearly, then, the real function of the auricles and the ventricles and of their valves, and he applied the lessons of the lesser, or pulmonary circulation, to the greater, or systemic circulation, and thus rounded out the true natural history of the process. In his own words:

"I frequently and seriously bethought me, and long revolved in my mind, what might be the quantity of blood which was transmitted, in how short a time its passage might be effected, and the like; and, not finding it possible that this could be supplied by the juices of the ingested aliment without the veins on the one hand becoming drained, and the arteries on the other hand becoming ruptured through the excessive charge of blood, unless the blood should somehow find its way from the arteries into the veins, and so return to the right side of the heart, I began to think might there not be a motion, as it were in a circle. Now this I afterward found to be true; and I finally saw that the blood, forced by the action of the left ventricle into the arteries, was distributed to the body at large, and its several parts, in the same manner as it is sent to the lungs, impelled by the right ventricle into the pulmonary artery, and that it then passed through the veins and along the vena cava, and so round to the left ventricle in the manner already indicated, which motion we may be allowed to call circular."

Thus clearly and forcefully he set forth in 1616 — although his work did not appear until 1628 — the true doctrine, and it is of interest to record that he lived to see it adopted practically by all scientists. Malphigi, in 1661, demonstrated, by means of the microscope, the capillaries, thus filling out the last link in the chain of evidence.

Mechanics of Circulation.—Harvey's work established the mechanical character of the heart's action, and, as it is now regarded, the heart is the pump which beats about 72 times a minute, thus forcing the blood with considerable velocity and force through the arteries. It is a double pump, as it were, both sides working simultaneously, the pulse-beat being the wave of the systolic contraction of the left ventricle. Each half of the heart consists of a smaller, less muscular portion, the auricles, and a larger, stronger portion, the ventricles, the left ventricle being much more powerful than the right. Leading into the heart and away from it are the aorta, pulmonary vessels, artery, and vein, and the vena cava. Between the auricles and ventricles are valves,—the mitral between the left auricle and left ventricle; the tricuspid corresponding on the right side; and the pulmonary and aortic valves. Starting with the spent blood that is collected from the entire body in the veins, this is carried, by pressure of the walls of the veins, through the vena cava, and emptied into the right auricle; this contracts, the valve at the orifice of the vena cava closes, the tricuspid valve opens, and the blood is forced into the right ventricle. It remains here a small fraction of a second, and this ventricle contracts, the tricuspid valve closes, and the blood is forced through the pulmonary artery into the lungs. Here it is spread out, mesh-like, in millions of capillaries, is oxygenated, and brought back to the left auricle by the pulmonary vein. The contraction of the left auricle forces the blood into the left ven-

CIRCULATORY SYSTEM



[The red lines show arteries; the blue, veins.]

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|---|---------------------------------------|
| 1. General Circulation in the Human Body. | 2. The Heart, showing Interior. |
| 3. Cross-Section of the Heart, seen from above. | 4. Circulation of Blood in the Lungs. |
| 5. Circulation of Blood in Digestive Tract. | |

CIRCULATION IN PLANTS — CIRCUMCISION

tricle through the mitral orifice, the valves behind closing, and finally the great throb of the heart is caused by the ventricular systole, the mitral valve closes tight, preventing regurgitation, and the blood bounds out into the arteries, the aortic semilunar valves closing as soon as the ventricle commences to expand to get its next supply. Thus this cycle goes on 72 times a minute on the average, night and day, until death quiets the heart's action. In actual operation the right and left sides are working simultaneously, and when one listens to the heart-beat one hears only the "lub-dup," "lub-dup," of the closing auriculo-ventricular valves, and the closing aortic and pulmonary tricuspid. From the arteries the blood goes to every structure in the body in the capillaries, and returns in the veins, whose valves prevent venous congestion, and once more into the vena cava. The whole cycle is complete in about 22 seconds, one thirteenth of the entire weight of the body in blood has been thus sent round the circuit, with an initial force of the ventricular contractions of about 4.5 foot pounds at an initial velocity of about 20 inches a second. In 24 hours thus the heart's energy would lift 124 tons in weight one foot. The vital or nervous mechanism that keeps the heart in motion consists in the main of three factors, the irritability of the heart muscle itself, the action of the cardiac nervous ganglia of the sympathetic, and the cardiac regulator nerve, the pneumogastric. If a salt solution of 0.6 percentage composition is passed through the fresh heart of many of the lower animals, the heart will commence to beat, thus showing that if the heart muscle is supplied with proper liquid it must beat, hence the irritability of the heart muscle is the first and most important factor in the phenomenon of circulation. The blood salts, notably calcium and potassium, supply the irritant, and muscular contraction results, but if the heart muscle alone is beating it does so rhythmically, but the different parts do not work in efficient unison, hence the need of a regulating mechanism other than the auricle "pace-maker." This is supplied by the cardiac ganglia, their irritation causes the heart to beat more rapidly, but not in unison. The chief regulator and steadier of the heart-beat, as well as the great trophic nerve, is the tenth nerve, the pneumogastric or vagus, coming from the medulla. This nerve brings complete order and system into the heart mechanism as adjusted to other conditions in the body. Its stimulation slows the action of the heart; its paralysis causes the heart to run away, given over to the ganglia and the muscle. Another important feature in the circulation is the elasticity of the blood vessels, or vessel tone. This is maintained by the sympathetic nervous system, which raises or lowers vessel tone in accordance with the needs of the cells of the body. A regular condition of blood-vessel tonus is essential to the life of the cells of the body, muscular as well as nervous.

Circulation in the Lower Animal Forms.—The motion of a limpid fluid can be rendered perceptible only by the presence of the corpuscles which it carries. In the blood it is rendered apparent in the capillary vessels by means of its globules. In infusorial animalcules the movement of the fluids of the body is maintained by that of the animal itself and by the disturbing influence of nutritive absorption. In the *Polypi* the movement receives aid besides from the ac-

tion of cilia on the inner walls of the body. The *annelids*, as the earth-worm, possess contractile vessels traversing the length of the body. The insects, crustaceans, myriapods, and spiders have a dorsal tube which in the common crab and the spider is much shortened and broadened, but in the others remains tubular, the blood regaining its cavity through slits in the sides as well as by the openings of the trunks which the heart gives off. In these animals the circulation is incomplete, that is, the blood does not flow through canals with definite walls, but in the interstices of the tissues. The *Mollusca* have the heart provided with an auricle and a ventricle, as in the snail and whelk; two auricles, one on either side of the ventricle, as in the fresh-water mussel, or two auricles and two ventricles as in the ark shells. Among the ascidians, which stand low in that division of animals to which the mollusks belong, the remarkable phenomenon is encountered of an alternating current, which is rhythmically propelled for equal periods in opposite directions. All vertebrated animals (except *Amphioxus*) have a heart which in most fishes consists of an auricle and ventricle, but in the mud-fishes (*Lepidosiren*) there are two auricles and one ventricle; and this trilocular heart is found in the amphibians, and in most reptiles except the crocodiles, which, like birds and mammals, have a four-chambered organ consisting of two auricles and two ventricles. In these two last-named classes the venous and arterial blood are kept apart; in the trilocular hearts the two currents are mixed in the ventricle.

Consult Schaëfer, 'Physiology'; Tigerstedt, 'Physiologie des Kreislaufes'; Foster, 'Lectures on the History of Physiology.'

See ANATOMY, HISTORY OF; BLOOD PRESSURE; ENDOCARDITIS; HEART.

SMITH ELY JELLIFFE,

Editor 'Journal Nervous and Mental Disease.'

Circulation in Plants. See SAP.

Circumcellions, sēr-kūm-sēl'ī-ōnz, **Circumcellio'nes**, or **Circelliones**, members of bands probably of fanatic monks, partisans of Donatus (q.v.) and the Donatists in Numidia and Mauritania who, avenging the condemnation of Donatus by the Synod of Arles (314) and the Council of Nicæa (325) and the condemnation of Donatus and his followers by Constantine and Constantius, roamed throughout those provinces pillaging and wrecking the churches and other religious establishments of the Roman Catholics and proclaiming the downfall of the empire itself. Their name probably is formed from *circum*, round about, and *cella*, cell, a monk's cell: if the derivation is correct these Circumcellions are of the same class of vagabond monks complained of by the father of western monachism, St. Benedict as *gyrovagi*, circulating vagabonds.

Circumcision, an amputation of a portion of the human organs of generation; principally performed on males, but sometimes on females. It has been practised in all ages, and by both civilized and savage races, as Arabs, certain African tribes, Christian Abyssinians, Australian "blacks," Malays, some North American Indians, Aztecs, Mayas, Caribs, South American Indians, Jews, Mohammedans, Fijians, and Samoans.

CIRCUMFERENCE — CIRCUMSTANTIAL EVIDENCE

In the male, the operation consists in removing a section of the prepuce. Doubtless the original object was cleanliness, a safeguard against venereal infection, or the moderation of the sexual passion, which are said to be results of the operation, but among the Jews it has always been a religious rite, for they regard it as the sign of the covenant made by Jahwé with Abraham and his posterity. The institution of the rite is recorded in Gen. xvii. Here it is stated that Abraham, then 99 years old, was himself circumcised, with his son Ishmael, 13 years old, "and all that were born in his house, and all that were bought with his money, every male among the men of Abraham's house." But by the terms of the covenant every man-child among the Hebrews was to be circumcised on the eighth day after birth, and this rule, peculiar to the race, is adhered to with such rigor that even the Sabbath observances are not allowed to interfere with the ceremony. Other Eastern nations have practised circumcision on various days,—the Arabs 7, 14, 21, or 28 days after birth, though Josephus states that in his day the Arabs circumcised after the age of 13 on account of the circumcision of Ishmael, their progenitor, taking place at that age; the Mohammedans of Persia circumcise in the third or fourth year; Fijians and Samoans in the seventh year; the Christian Abyssinians in the sixth, seventh, or eighth year; while some of the African tribes that practise the rite follow the Jewish rule; others, again, performing the ceremony between 30 and 60 days after birth.

Circumcision is universally practised by Mohammedans, not on the authority of the Koran, which does not enjoin it, but as following the example of Mohammed. It seems to be doubtful whether Mohammed's omission to prescribe the rite was due to his deeming such a rule valueless where custom already decreed it, or because he attached only a physiological and not a religious importance to the ceremony. It is, however, now recognized as a religious obligation just as strongly as if it had been ordained by the founder of Islam. Circumcision among Mohammedans may be practised seven days after birth, but it is customary to postpone the ceremony to some time between the 7th and 12th year.

Christianity recognizes no religious significance in the rite, substituting for it, according to St. Paul (Rom. ii. 25-29) "circumcision of the heart." The Church, however, celebrates as a festival the first of January, as being the day of the circumcision of its founder.

Circumcision of proselytes to the Jewish or Mohammedan faith is insisted on by the orthodox, and previous circumcision for surgical reasons is not accepted as sufficient compliance with the requirements of religion. Among some "reformed" Jews, however, the circumcision of adults has lately been abandoned. Among many savage tribes the rite is undergone at the age of puberty, and is perhaps in such instances more of a sociological than a religious ceremony, being akin to other mystic rites which mark the entrance of the young into full tribal fellowship.

The circumcision of women is effected by the removal of a portion or the whole of the clitoris. It is perhaps practised more in

Arabia than elsewhere, but has never prevailed among Jews.

Circumcision is much favored by physicians and surgeons of the present day as a hygienic measure irrespective of any religious associations.

ELFORD E. TREFFRY.

Circum'ference, or **Periphery**, the curve which encloses a circle, ellipse, or other plane figure. In figures bounded by straight lines, as the triangle, square, and polygon, the term perimeter is employed to designate the sum of all the bounding lines taken together. The length of the circumference depends partly on the nature of the curve; thus, that of the circle = $2\pi r = \pi d$ and that of the ellipse =

$$2\pi a \left\{ 1 - \left(\frac{1}{2}\right)^2 \frac{e^2}{1} - \left(\frac{1.3}{2.4}\right)^2 \frac{e^4}{3} - \left(\frac{1.3.5}{2.4.6}\right)^2 \frac{e^6}{5}, \text{etc.} \right\}$$

where a is the semi-axis major, and e the eccentricity.

Cir'cumflex, in grammar, one of the three accents, formed by the union of the other two, thus, $\overset{\wedge}{\sim}$. It originally denoted a rising and falling of the tone in the pronunciation of the syllable. It is not used in English, and in French is usually a sign of the elision of a letter, and therefore indicates a prolonged sound.

Cir''cumlocu'tion Office, a name used by Dickens, in 'Little Dorrit'; he applies it to the delay and slowness of British officialism and especially when dealing with poor and friendless persons, imprisoned for petty offenses.

Cir''cumnuta'tion, the continuous motion of every growing part of a plant, in which it describes irregular elliptical or oval figures. The apex of the stem, for instance, after pointing in one direction, moves round till it points in the opposite direction, and so on continuously. The term circumnutation was first used by Darwin.

Circumpo'lar Stars, stars near the Pole that appear to move around it, and perform their circles without setting. A star whose polar distance is less than the latitude of a place will never set at that place. They are constantly used by astronomers in connection with meridian work for determining the correction to be applied to transit observations to free them from the errors due to the slight departure of the line of collimation of the instrument from the plane of the meridian as it revolves on its axis. The pole-star Polaris or Alpha Ursæ Minoris, usually known as the North Star, is the most used for that purpose.

Circumstantial Evidence, evidence which tends to prove a particular fact by the proof of other facts, from which it is concluded that the particular fact must have happened. It is the natural and reasonable inference resulting from facts which have been established.

If A is on trial for the murder of B, and a witness testifies that he saw A shoot B, and a few minutes later B died, that would be direct evidence; whereas if the witness testified that B had been shot, and the bullet found in the body of B was of a particular make only used by A, and that A was in the neighborhood at the time of the shooting, the jury might infer that A was guilty; but if A could

CIRCUMVALLATION — CIRCUS

prove that his pistol had been stolen from him shortly before the shooting, and he had not recovered it at the time of the shooting, it would be a complete defense, and the verdict would depend on the credibility of the witnesses.

Circumstantial evidence is of two kinds: that from which a certain conclusion necessarily follows, and that from which a certain conclusion is only probable or likely. If the body of a man is found with a bloody right hand impression on a part of his body where it is impossible for him to put his right hand, the presumption is that some one was present at or since the time the person was hurt; but if that is all of the evidence, it is impossible to tell whether the bloody impression was made by the person at the time of the assault, or by some one after the assault had been committed. In civil cases the jury may decide according to the weight of the evidence; but to convict a person of a crime the evidence must be such as to leave no reasonable doubt as to his innocence. See **LAW, CRIMINAL**.

Cir'cumvalla'tion, a fortification consisting of a parapet of earth and a trench, constructed by a besieging army around its camp, to guard against attempts to relieve the place besieged.

Circus, a word which has come down to us from the Latin without change, meaning "circle," and used by the Romans to indicate the place in each city where chariot races, gladiatorial contests, and feats of skill were held. The circus building in Roman times was without a roof, rectangular in shape, except that one short side formed a half-circle; on both sides, and on the semicircular end, were the seats of the spectators, rising gradually one above another, like steps. The largest of these buildings in Rome was the Circus Maximus, 1,875 feet long and 625 feet wide, and capable, according to Pliny, of containing 260,000 spectators. At present but few vestiges remain, and the circus of Maxentius is in a better state of preservation. Grown great through conquest of other peoples, the Romans of 2,500 years ago (and for 10 centuries later) encouraged all forms of pleasure which would develop to its highest pitch the fighting instinct in their soldiery. Among the circus games were chariot races, a favorite sport of the Romans; athletic contests; the Trojan games, contests on horseback; and combats with wild beasts in which beasts fought beasts, or beasts with men (either criminals or volunteers). The prizes given to the victors were often valuable, and the honors great. In the decadence of Rome came a decline of the circus, and it was frequently debased by revolting spectacles, in which Christians or others temporarily hated by the government were given over to wild beasts, or crucified. Julius Cæsar dug ditches around the circus and filled them with water. This served the double purpose of protecting the spectators from the sudden swerving of a chariot or spring of a tiger, and of making possible the novelty of feats of skill on the water. Most of the vessels then were propelled entirely by banks of oars, and Cæsar held rowing-races, swimming-races, etc. Most of our grotesque picnic-games, like swimming in a barrel or running in a sack, are relics

of his fertile inventions to please his restless, turbulent people. There was no charge to see these entertainments, as a rule, the circus being used as a pacifier by the emperor.

America has taken the lead in the reproduction of the Circus Maximus. This is probably because the American people are of a similar strenuous, contest-loving, restless disposition. It was his acute perception of this disposition in his countrymen that led Phineas Taylor Barnum (q.v.) a Connecticut Yankee, to devote his life to entertaining his countrymen by giving them a real circus. He first started the American Museum at the corner of Broadway and Ann street, New York, a site now occupied by the 20-story St. Paul Building. Soon he began to exploit all kinds of freaks and curious human beings, "Tom Thumb" and other dwarfs being among his features. He saw the greed of the public for odd, grotesque things. "The public loves to be humbugged," was one of his frequent declarations. Yet Barnum always gave the people what he promised, and soon had on the road the beginning of what has since become perhaps the largest "show" on earth. From Barnum's death till 1906 the circus was directed by Mr. Bailey, his partner for some years previous to that event. The magnitude of the Barnum & Bailey circus and menagerie can scarcely be described. It is usually formed by making three immense rings, three different performances being given simultaneously. With 1,000 performing horses, 2,000 horses to haul the tents and equipment from town to town, hundreds of wild beasts in a menagerie, 500 performers, bare-back riders (both sexes), clowns, aërialists, tumblers, etc.—1,200 other employees to care for the animals and erect the tents (seating 25,000), put up show-bills, etc., advance agents, cashiers, managers, and other attachés, bringing up the total to about 3,000 people employed during the season, the conducting of such a circus requires consummate ability and great pecuniary resources. A dozen trains of cars are necessary to carry this exhibition, and a whole ship is used when it visits Europe, as it often does, successfully. The capital invested in this and other circuses in America is enormous, being not under \$100,000,000. There are 8 or 10 of the very large circuses, and 20 more smaller ones at work in America at present (1903). The admission price to the common seats was primarily fixed by Barnum at 50 cts., and this has never been varied from since. The better seats, near the centre, are \$1.00. These seats correspond to those of the Roman emperor and his court in the old Circus Maximus. Vast crowds attend these exhibitions, particularly in the rural districts, where "circus day" is as much of a holiday as 4th July. Unless a continuous season of rainy weather is encountered, the profits accruing to the proprietors of these circuses at the end of the season (about October) are usually 100 per cent or more.

Since about 1890 there has developed a peculiar American form of circus which is worthy of mention. This is a reproduction in the ring of the habits and customs of the "cowboy" and pioneer of our own western plains. The exhibition is termed a "Wild West" show. It was originated, practically, by William F. Cody (q.v.), known on the plains as "Buffalo Bill."

He was a former government scout, and thus became familiar with many Indian tribes. With the aid of "Nate" Salisbury he organized an exhibition of frontier and Indian life which rivals Barnum & Bailey's in point of interest and profit. He has a hundred western cattle-herders, who give marvelous illustrations of the perfect horsemanship of the plains; he has many American Indians from a score of tribes, who give their war-dances and weird chants; he has Mexican lariat-throwers, who perform wonderful feats with a swirling rope; he has "rough riders" from many lands. Altogether, this makes a "show" which appeals powerfully to both the young and the old American. Several less important "Wild West" have also been organized.

Some American college youth have recently endeavored to revive interest in the ancient Grecian Olympic games. Delegations went to Athens in 1902 and 1906 to compete with the modern Greeks and other national champions. These efforts may eventually rehabilitate the hippodrome and Circus Maximus in the lands which gave them birth. See HIPPODROME.

Cirencester, sis'ĕ-tĕr, England, a town in the county of Gloucester, on the river Churn, 18 miles southeast of the city of Gloucester. The chief industries are malting, brewing, and cutlery manufacture; it also has a large wool trade. The town contains the remains of the gateway of an abbey founded in 1177; and several churches of interest. In the environs is the well-known Royal Agricultural College, with a large number of students coming from all parts of the world. Cirencester was founded by the ancient Britons, and later, under the name of Corinium, became a Roman station. Various Roman remains, including those of an amphitheatre, have been discovered in it, and numerous relics belonging to this period of its history have from time to time been found and placed in the local museum. It was the scene of engagements during the civil war of the 17th century. Pop. (1901) 7,530.

Cirillo, Domenico, dō-mā-nĕ'ko chĕ-rĕl'lo, Italian republican and naturalist: b. Grugno, Naples, 1734; d. Naples August 1799. He officiated in early life as professor of botany, afterward accompanied Lady Walpole to France and England, became a Fellow of the royal society of London, a friend of Buffon, D'Alembert, and Diderot, and on his return to Naples was appointed physician of the court. After the proclamation of the republic by the French, he was chosen representative of the Neapolitan people, and member of the legislative commission (1799); and on the re-establishment of royalty suffered death on the scaffold, rather than take the oath of allegiance or ask a pardon from King Ferdinand. His principal writings are: 'Fundamenta Botanica' (1787); and 'Entomologiæ Neapolitanæ Specimen' (1787); folio.

Cirl-Bunting, sĕrl'bun'ting, a small and very handsome European bunting (*Emberiza cir-lus*), rare and local in England, often kept as a cage-bird, though its song is slight.

Cirpan, cher'pān, a town of eastern Rumania, Bulgaria, on the tributary of the Maritza, 30 miles east of Philippopolis. It is situated in a fertile, fruit-producing region and is noted for its mineral springs. Pop. 11,069.

Cirque, sĕrk, the name applied to basins occurring in mountainous regions at the head of narrow stream valleys and gorges. They are characterized by precipitous walls, which curve around in a semicircle, forming a natural amphitheatre. Their origin may be traced to the erosive action of converging glaciers and streamlets.

Cirrhosis, sĭ-rō'sis, a process of chronic, inflammatory reaction in an organ, due to some form of constant irritation. It is characterized by the excessive production of connective tissue in the part, which increase of connective tissue gradually encroaches upon the blood-vessels of the organ and slowly invades its essential portions. Cirrhosis may occur in almost any portion of the body, but it is characteristically present in only those organs which are rich in functioning parenchyma, such as the kidney, liver, spleen, pancreas, and brain. In each of these organs it produces a very definite form of lesion, with a clearly defined clinical course and history. Thus, in the kidneys, cirrhosis constitutes one of the forms of Bright's disease or chronic nephritis (q.v.). Cirrhosis of the liver results in a well-defined form of liver-disease, or chronic cirrhotic hepatitis (q.v.). Cirrhosis of the spleen, and cirrhosis of the pancreas also occur, and there is a well-known form of cirrhosis of the brain associated with degeneration. (See GENERAL PARESIS.) These different forms of cirrhosis will be discussed under their separate headings.

Cirripe'dia, an order of entomostracous *Crustacea* (barnacles), sometimes ranked as a sub-class, always fixed in the adult stage, but with free-swimming larvæ having three pairs of appendages (*nauplius*) like other *Crustacea*. The typical barnacles have the body enclosed in a reduplication of the skin which secretes a calcareous shell, on which account they were classed with the *Mollusca* until the discovery of their free-swimming larvæ led to a closer investigation of their structure. Owing to adaptation to a sedentary life segmentation of the body has become obscure, and the six pairs of jointed biramous appendages are mere fringed scoops for creating currents in the water. The eyes and other sense organs have likewise degenerated, and most species are hermaphroditic. The barnacles are exclusively marine, and a great many are parasitic.

Four sub-orders are distinguished: (1) *Thoracica*, including the typical, free-living, shelled barnacles of which the sessile forms (*Balanidæ*, *Coronulidæ*, etc.), are well known as rock and ship barnacles in which the animal is protected by a conical shell formed of several pieces, with a multivalve conical movable lid, having an opening through which several pairs of long, many-jointed, hairy appendages are thrust, thus creating a current which sets in toward the mouth. The young have oval bodies, with a single eye, a pair of antennæ, with three pairs of legs. After swimming about for some time it attaches itself by its antennæ to some object, and now a strange backward metamorphosis begins. The body becomes enclosed by two valves, the stalk by which it is anchored grows larger, the feet become more numerous, and eventually the barnacle shape is attained. The goose-barnacle (*Lepas*) is not sessile, but is flat and triangular, and attached to floating bits

CIRRUS — CISSAMPELOS

of wood or seaweed by a long, large, soft stalk. (2) *Abdominalia*, parasitic barnacles, in which the sexes are separate and very unequal in size. In this group is presented the remarkable phenomenon of dwarfed complementary males discovered by Darwin. The females live in burrows in the shells of mollusks and other barnacles, while the males are minute, lack mouth, digestive canal, and appendages, and live, often several together, permanently attached to the female. (3) The *Apoda*, whose body is maggot-shaped, are hermaphrodite and parasitic in other barnacles. (4) *Rhizocephala*: This group presents perhaps the most extreme cases of degeneration, through parasitism, known among animals. *Sacculina*, which attaches itself to the abdomen of the crab, is little more than a bag of genital organs which draws its nourishment from the tissues of its host by means of branching root-like processes which penetrate to every part of its body. Consult Darwin, 'Monograph of Cirripedia.'

Cirrus. See CLOUD.

Cir'rus, in botany, the tendril by means of which certain plants climb, usually a modified leaf or the prolongation of a midrib.

Cirta, sîr'tâ, a city of northern Africa, the capital of the Numidian prince Syphax, and an important fortress of Masinissa and his successors. Later it became a flourishing Roman colony. It was much injured by the troops of **Masentius** in 310 A.D., but was restored by **Constantine** and named Constantina. The modern Constantine occupies its site.

Cisal'pine Republic, Italy, a former State in the northern part. After the battle of Lodi, May 1796, Gen. Bonaparte proceeded to organize two states — one on the south of the Po, the Cispadane Republic, and one on the north, the Transpadane. These two were on 9 July 1797, united into one under the title of the Cisalpine Republic, which embraced Lombardy, Mantua, Bergamo, Brescia, Cremona, Verona, and Rovigo, the duchy of Modena, the principalities of Massa and Carrara, and the three legations of Bologna, Ferrara, and the Romagna. The republic had an area of more than 16,000 square miles, and a population of 3,500,000. The seat of the government or Directory was Milan. The army consisted of 20,000 French troops, paid by the republic. The republic was dissolved for a time in 1799 by the victories of the Russians and Austrians, but was restored by Bonaparte after the victory of Marengo, and some modifications of constitution were made and the area was increased. In 1802 it took the name of the Italian Republic, and chose Bonaparte for its president. In 1805 the republic sent a deputation to Napoleon, with authority to give him the title of King of Italy. The territory was known as the kingdom of Italy until 1814. In 1815 it became a part of Austria. It is now a part of the Italian kingdom.

Cisco, sîs kō, a local name, probably from the Indian language, applied to several species of fresh-water fishes of the family *Salmonidae* (q.v.) and closely allied to the white-fishes (q.v.), with which they are sometimes placed in the genus *Coregonus*, or separated under the name *Argyrosomus*. They are distinguished from the true white-fishes by having the lower

margin of the premaxillary bone horizontal instead of vertical, and by the larger mouth. Nine or ten species have been described from North America, most of them belonging to the waters of particular lakes or lake systems. The most important is *A. artedi*, which is found in the Great Lakes and adjoining regions, being represented in the small lakes of Indiana and Wisconsin by a slightly modified race. Under the name of lake herring it is the object of an extensive fishery on the lakes, second in value only to that of the true white-fish. It is a voracious fish, swimming in large schools, frequenting deep waters during most of the year, but spawning in the shallows during the winter. The other species inhabit various lakes and the river systems of Alaska, etc. Similar species also occur in Europe and Asia.

Cisleithan (sîs-lî'thân) **Provinces**, Austria proper or Austria west of the river Leitha, which partly forms the boundary between it and Hungary. This portion of the Austro-Hungarian monarchy contains about 115,850 square miles. Pop. (1900) 26,107,304.

Cisleithania, a river on the boundary line between Austria and Hungary.

Cisneros-Betancourt, thēs-nā'rōs bē-tōn-kōor', **Salvador**, Cuban patriot: b. Puerto Principe 1832. He was a descendant of one of the best families of Spanish nobility, and possessed the hereditary title of Marquis of Santa Lucia. During the revolution of 1868-78, he was president of the Cuban House of Representatives, and during a part of the time president of the Cuban republic. In 1895 he was re-elected president of the new Cuban republic. His niece, Evangelina Cosío Cisneros, was imprisoned by the Spaniards for aiding the insurgents during the insurrection in 1896-7, and made a sensational escape, coming to the United States, where she became a protégé of Mrs. Gen. John A. Logan. His daughter tendered her services to the United States as an army nurse during the war with Spain in 1898.

Cispadane (sîs-pā'dān) **Republic**, Italy, a republican state established by Napoleon in 1796, after the battle of Lodi. It comprised Bologna, Modena, Ferrara, and Reggio. In 1797 it was united with the Cisalpine Republic (q.v.).

Cisplatine (sîs plā'tîn) **Republic** (Lat. *cis*, on this side, and Sp. *Plata*, name of the river on the boundary between Uruguay and Argentina). The Republic of Uruguay was called by this name from 1828 to 1831. Previous to becoming an independent state it had belonged to Brazil, and was called Cisplatine Province.

Cisrhenish Republic, or **Cisrhenam Republic**, several towns on the Rhine, particularly Cologne, Aix-la-Chapelle, and Bonn, at the time when so many republics were created, declared themselves independent, under French protection, and took the title of *Cisrhenish Republic* in September 1797. But at the Peace of Campo-Formio (17 Oct. 1797), the left bank of the Rhine, including the Cisrhenish Republic, was ceded to France by a secret article, and the confederation bearing this name is in consequence hardly known.

Cissampelos, a tropical genus of climbing shrubs of the natural order *Menispermaceæ*,

CISSEY — CISTERN

whose growth is similar to that of an ivy vine. The plant is of great commercial value because of its medicinal qualities, especially the velvet-leaf of Brazil, (*Cissampelos pareira*), the root of which supplies the spurious pariera brava, abuta root, used in medicine as a tonic. Other species growing in nearly all tropical countries are used for emetics and cathartics, and an East Indian species (*C. obtecta*) yields an intoxicating spirit.

Cissey, sē'sā, **Ernest Louis Octave Courtet**, French general: b. Paris 1811; d. there 1882. He was educated at the military school of St. Cyr and having served with distinction in Algeria and the Crimea, he was promoted in 1863 to be general of a division. He fought in the Franco-Prussian war, and in the contest against the Commune of 1871. He was elected to the National Assembly in February 1871, and was minister of war from 1871 to 1873, and in 1874-6. He was elected life senator in 1875.

Cis'soid, a curve in geometry, the locus of the vertex of a parabola rolling upon an equal parabola. If pairs of equal ordinates be drawn to the diameter of a circle, and through one extremity of this diameter and the point in the circumference through which one of the ordinates is let fall, a line be drawn, the locus of the intersection of this line and the equal ordinate is known as the cissoid. This curve was discovered by Diocles while he was seeking the solution of the celebrated problem of the duplication of the cube.

Cist, **Henry Martyn**, American soldier: b. Cincinnati, Ohio, 20 Feb. 1839; d. Rome, Italy, 17 Dec. 1902. He graduated at Belmont College 1858, and began the study of law, but enlisted as a private in the Sixth Ohio Regiment 21 April 1861, attaining, before his resignation 4 Jan. 1864, the brevet rank of brigadier-general. He was post-adjutant of Camp Chase during the imprisonment of the Confederates captured at Fort Donelson, assistant adjutant-general of the Army of the Cumberland, and later, on the staff of Gens. Rosecrans and Thomas. After the war he practised law in Cincinnati, was twice mayor of College Hill, originated the project that resulted in the conversion of the Chickamauga battlefield into a national park, and was a contributor of military articles to the magazines. He wrote 'The Army of the Cumberland' (1882); and collaborated with Donn Piatt in a 'Life of General George H. Thomas.'

Cist, a place of interment of an early or prehistoric period, consisting of a rectangular stone chest or inclosure formed of rows of stones set upright, and covered by similar flat stones. Such cists are found in barrows or mounds, enclosing bones. In rocky districts cists were sometimes hewn in the rock itself. See BURIAL; BURYING PLACES.

Cistaceæ, sīs-tā'se-ē. See CISTUS.

Cistercians, sīs-tēr'shē-āns, a monastic order in the Roman Catholic Church founded in 1098 by St. Robert of Molesme, a Benedictine monk of Cluny (q.v.) at Cistercium, near Dijon in France. After a year Robert of Molesme was succeeded as abbot by the monk Alberic and he in turn by St. Stephen Harding, an Englishman, who ruled the order during 25 years with great wisdom and who is regarded as its

second founder and lawgiver: his day in the Church calendar is 17 April. The Cistercian order in his time grew to be the most considerable monastic order in the Church, and to him in great part is due the founding of the four greatest Cistercian monasteries of France, next after Citeaux, namely, La Ferté, Pontigny, Clairvaux, and Morimond. By the middle of the 12th century Citeaux had affiliated to it 500 abbeys and priories, and early in the 13th their number was 1,500, of which very many were convents or priories of Cistercian nuns. For 200 years the austere rule of St. Benedict as reinforced by St. Stephen Harding was maintained throughout the order: there was the chanting of matins and lauds at midnight throughout the year in the abbey or priory church; there was a strict fast on one slender meal from 14 September to Easter; there was abstinence at all times (cases of sickness excepted) from all animal food, save that very rarely milk was allowed. The austerity of the Cistercian rule extended even to the churches of the order: simplicity was sought in everything; there was no fatuous display of ornamentation, either of the edifice or of the vestments, or of the sacred vessels; the copes and chasubles employed in the church services were of white linen instead of silk or cloth of gold; the chalices and the pyxes, instead of being of gold incrustated with precious stones, were of plain silver. But the church schisms and the wars and civil commotions of the 14th century led to the plundering of the abbeys and priories, and the monastic discipline was greatly relaxed, so that on the one hand it became necessary for the see of Rome to sanction in some respects this relaxation, while on the other hand there arose zealous upholders of the ancient rules who brought back the primitive observance in all its rigor. Among the most notable of these revivers of the ancient rule was the abbot De Rancé of the monastery of La Trappe (q.v.) in the 17th century. At the dissolution of the English monasteries by Henry VIII. there were in England and Wales 115 Cistercian houses, of which 25 were for nuns. In the period of the French Revolution most of the Cistercian Cenobia, not only in France, but throughout the continent of Europe, were suppressed. In the United States there are two Cistercian abbeys, namely, that of La Trappe at Gethsemane in Kentucky, and that of New Melleray, near Dubuque, in Iowa. The most noted English Cistercian's houses were the abbeys of Furness, Fountains Rievaulx, Tintern, Kirkstall, and Woburn. A modern English Cistercian abbey is situated at Mount Saint Bernard, not far from Leicester. See JANAUSCHEK, 'Origines Cistercienses' (1877); Guignard, 'Monuments primitifs de la règle Cistercienne' (1877); Sharpe, 'Architecture of the Cistercians' (1874); Lefroy, 'Ruined Abbeys of Yorkshire' (1889); Eulart, 'Origines de l'architecture Gothique en Italie' (1893).

Cistern, a tank for holding water. Cisterns differ from wells in that they do not get their water from natural sources, such as springs, but through channels made by the hand of man. In hot countries, where the supply of water is not regular, or where rain water is used, cisterns are necessary for storing up water for future use. They are also largely used for the

CISTUS — CITIZEN

supply of locomotive boilers at railroad stations. Cistern water used for drinking is usually filtered.

Cistus, the typical genus of the rock rose family (*Cistaceæ*), a family having four genera, and about 160 species, of which two at most are found outside the northern hemisphere. The American representatives of the family belong to the genera *Helianthemum*, *Hudsonia*, and *Lechea*, most of the species being pestiferous plants, such as the frost-weed or Canadian rock rose (*H. canadense*), poverty-grass (*Hudsonia ericoides*), and the pin-weeds (*Lechea*). *Cistus* does not grow wild in America, but some species are cultivated in greenhouses and the warmer regions for the beauty of their large wild roselike flowers, which are often of two colors. This genus, which is a native of the countries of Europe, is generally a beautiful evergreen flowering shrub, ornamental in gardens or shrubberies. Gum ladanum is obtained from *C. creticus*, and *C. ladaniferus*. This gum was formerly used as an external stimulant in plasters, but is now almost obsolete in medical practice.

Cit'adel (from the Italian *cittadella*, a diminutive of *città*, city; signifying little city), in fortification, a kind of fort, consisting of four, five, or six sides, with bastions, commonly joined to towns, and sometimes erected on commanding eminences within them. It is distinguished from a castle by having bastions.

Citation, a summons or official notice given to a person to appear in a court as a party to a cause. A writ issued out of a court of competent jurisdiction, commanding a person therein named to appear on a day named and do something therein mentioned, or show cause why he should not. Proctor, Prac.

In cases in which a citation issues it is generally the writ commencing the action, the same as a summons in trespass or a bill in equity. The citation is used by courts having control over the estates of the dead.

Cithæron, sī-thē'rōn, or **Elatea**, a range of mountains in Greece, which stretches northwest, separating Bœotia from Megaris and Attica. The loftiest summit rises 4,620 feet above the sea, and is the subject of numerous fables and classical allusions. On its northern slope stood the city of Plataea, the circuit of whose walls may still be traced. Its modern name, Elatea, from *elatē*, a fir, is derived from the pine forests which are abundant on its sides and summit.

Cithara, sīth'a-ra, a guitar-like musical instrument, said to have been invented by Apollo. The strings, usually five or six in number, were struck with a plectrum, or picked with the fingers. It was the forerunner of the banjo, guitar, zither, and similar instruments. See LYRE.

Cities, Water Supply of. See WATER SUPPLY.

Cities of the Plain, Sodom and Gomorrah, chief of the five cities which were destroyed by fire from heaven, and their sites overwhelmed by the waters of the Dead Sea.

Cities of Refuge, according to the law of Moses six out of the 48 cities which the Israelites were directed to give to the tribe of Levi, in the division of the land of Canaan among their tribes, were to be set apart as cities of

refuge for the manslayer or accidental homicide. The right of avenging murder belonged to the next-of-kin of the murdered man; but the slayer fleeing to one of these cities, three of which were to be on either side of Jordan, the avenger of blood was forbidden to touch him till he stood before the congregation in judgment, when, if he were found to have acted without premeditation or malice, he had a residence appointed him in the city of refuge until the death of the high priest, and was then permitted to return to his inheritance. If the slayer violated this regulation by leaving the city of refuge before the death of the high priest, the avenger of blood might kill him with impunity. The six cities of refuge appointed in accordance with this law were Kedesh, Shechem, and Hebron on the west side of Jordan; and Bezer, Ramoth-Gilead, and Golan on the east. This law of refuge seems to have been favored by the Levites, to whom it gave a measure of political influence, much in the same way as the privilege of sanctuary did to the monks, abbots, and other dignitaries of the Roman Catholic Church; it was consequently interpreted by them in the most liberal way. Maimonides says that all the 48 cities of the Levites had the right of refuge, although only the six were obliged to receive and lodge the slayer gratuitously.

Citizen, originally, a member of the body of freemen entitled to share in the government of a *civitas*, or city-state of the ancient type; as the Roman state gradually broadened into the entire ancient world, the citizenship was extended piecemeal for political reasons, till Justinian made it coextensive with personal freedom, and the attribute of all residents of the empire except slaves. With the rise of the miscellaneous modern community, where flux of population permanent and temporary is going on, and the mass of people share in the government to a varying extent, the question of its limitations and the privileges it confers have become acute, and that of its legal definition has furnished one of the grounds of a civil war. The definition varies in different countries. In monarchies it is commonly used only of a resident's relation to his municipality, the term "subject" expressing the relation to the state; in republics generally it means a regular member of the community, subject to its ordinances, obligated to its support and defense, and entitled to its protection. In the United States, a complication is introduced by the federal structure of the government, there being a citizenship of each distinguished from that of the other. The questions arising in this country are therefore: (1) What constitutes citizenship; (2) What rights it confers; (3) How it is acquired; (4) How it can be lost; (5) What are the respective obligations to State and nation.

I. A citizen has been legally defined as "one who owes to the government allegiance, service, and money by way of taxation, to whom the government in turn grants and guarantees liberty of person and of conscience, right of acquiring and possessing property, . . . suit and defense, security in person, estate, and reputation." In a word, the citizen is one whose lot is cast in with his society, for all social purposes according to his status and means, to fight or pay unless he is a dependent member of a group which fights, pays, etc. This includes

CITIZEN KING — CITIZENS' INDUSTRIAL ASSOCIATION

women, children, defectives, and criminals; and excludes alien residents (see, however, section 3), and Indians living in tribal relations, who are "dependent subjects." It should be added, however, that for jurisdictional purposes resident aliens are regarded as citizens, and in commercial and business legislation "citizen" is equivalent to "resident."

2. Citizenship implies civil but not necessarily political rights. The former are one for all, and are the primary obligation of a government to secure to its members; political rights are endlessly varied and within the discretion of the government. The right of direct share in government is everywhere withheld from minors, convicts, and the insane or idiotic, nearly always from paupers, and most generally from women; but these do not cease to be citizens. On the other hand, voting has occasionally been permitted in this as in foreign countries to persons not citizens of a State or municipality, for holdings of property, and could be so again. It was on this distinction that the minority in the Dred Scott case based their dissenting opinion that a slave's lack of political rights did not prevent his being a citizen with a right to sue in the courts; and the government by the Fourteenth Amendment ratified this view, and definitely dissociated civil from political rights.

3. Citizenship may be acquired by birth, every child born on the soil or within the jurisdiction of the United States,—even of resident aliens, except of foreign official representatives, whose residences are assumed to be part of their country's territory,—or of citizen parents traveling abroad, or of its officials resident abroad, being a citizen; or by naturalization; or by succession to a parent's or husband's rights,—the wife of an alien becomes a citizen by his naturalization, or after his death before naturalization if he had previously declared his intention of becoming so; and the children inherit similar rights.

4. It may be lost by formal renunciation, but the abandonment will not be presumed without it, even from a lifetime of residence abroad; but the government, with most civilized governments at present, recognizes full right to change allegiance at will. This was one of the issues in the War of 1812, Great Britain firmly refusing to recognize it; and it was not till 1870 that that country formally admitted that right.

5. Dual allegiance. The nature of the obligations is different: any one may be a citizen of the United States, yet not of any particular State, but not *vice versa*; and as the citizenship of the nation is the more universal, so it is of the higher sanction. The two could not in fact come into conflict except through an act of secession, which must be fought out, so that the question is academic, as short of that the whole matter would involve a case in the supreme court, pending which the question would be in abeyance; but in case of forcible resistance of a State to a decree of the nation, the citizen's first allegiance is to the latter. Further than this, however, the national government cannot go beyond the scope of its reserved powers; and a State can go very far in the direction of abolishing even the civil rights of its citizens under the shelter of this flexible permission. It should be noted that the right of citizenship is

totally unconnected in essence with the right of suffrage or the elective franchise. The former is an elemental right of all born among, or who have cast in their lot with, a civil society; the right to the protection of its laws and its strength, to a share in its benefits and its charities. The latter, a right to share in the governmental management of a society, is a mere question of the best machinery of management, and dependent on the fitness or power of individuals or classes to help guide that machinery. The unfit or weak are just as much citizens as the fit or the strong, by natural right; women and minors, defectives and criminals, have the fullest right to claim the protection of the laws, by themselves or their natural or appointed guardians. The suffrage is only a substitute for a battle, assuming that the larger body could outfight the smaller; and admission to it lies in the discretion of the fighting body.

Citizen King, The, a title applied to Louis Philippe, king of the French, 1830-48.

Citizen of the World, the signature of Oliver Goldsmith's 'Letters from a Chinese Philosopher residing in London, to his friends in the East.' The work was published in 1762.

Citizens' Industrial Association of America, The, a national federation of local employers' associations, citizens' alliances, and State and national organizations representative of business interests, organized as the culminating step in the movement for the organization of employers in 1903. Nearly all the large cities, and scores of the smaller ones, during the months following the anthracite strike of 1902, became the centres of considerable agitation on the labor question, and from 400 to 500 local associations sprung into existence for the purpose of combating what was termed the lawless aggressions of organized labor. The membership of some of these associations was confined to employers, while others, which adopted the general name of alliances, admitted professional men, and even employees, into their ranks. In cities like Chicago, Saint Paul, Omaha, Kansas City, Saint Louis, Detroit, Cincinnati, Louisville, and New York employers' associations were formed, while in Denver and all over Colorado and many other parts of the West, as well, also, in the smaller towns of the Central States, the alliance was the most popular form of organization. In response to a call issued by a number of the prominent leaders in the employers' movement, a convention was held in Chicago, 29-30 Oct. 1903, which was attended by nearly 300 delegates, who came from all parts of the United States and Canada, cities as far apart as San Francisco, New Orleans, Montreal, and Minneapolis being represented. The name of the Citizens' Industrial Association was considered as being inclusive in meaning of both employers' associations and citizens' alliances, and was selected by the convention for the new organization. The purposes, as set forth in the constitution adopted, were those of law enforcement, the maintenance of individual liberty, the securing of industrial peace, and the perpetuation of free competitive conditions in industry. The organization stands for the open shop, and no restriction of output. Its work is largely confined to that of educational propaganda, and it maintains a publication bureau for this purpose.

CITIZEN — CITTADELLA

It does not interfere in any respect with the internal government of its constituent associations, and the action of its convention or executive committee is advisory and not obligatory upon its members. The association forms a central source of information for its members and a directing agency in matters of national legislation in which the associations generally are interested. In the contest in the present Congress over the eight-hour and anti-injunction bills, which are fathered by organized labor, the Citizens' Industrial Association is taking an active part. The National Association of Manufacturers is a member and one of the principal elements of support in the new organization. Its president in 1904, David M. Parry, was chosen by the Chicago convention as the first president of the association. The secretary, chosen by the executive committee, was A. C. Marshall, of the Dayton Employers' Association, Dayton, Ohio. Vice-presidents were J. C. Craig, of the Denver Citizens' Alliance, and J. T. Hoile, of the New York Manufacturers' Association, with offices in Brooklyn. The treasurer in 1904 was Major A. C. Rosencranz, of the Evansville Alliance.

DAVID M. PARRY,

President Citizens' Industrial Association.

Citizen, The a comedy by Arthur Murphy, performed 2 July 1761, at the Drury Lane Theatre, and printed in 1763. It is founded in part on Destouche's 'Fausse Agnès.'

Citric Acid ($C_6H_8O_7 \cdot H_2O$), a very widely distributed acid, present in most common fruits, such as gooseberries, currants, lemons, citrons, cherries, and many others. It was first separated and distinguished by Scheele in 1784. It is generally prepared from lemon juice, the dark treacle-like fluid imported from Sicily, by fermenting it, filtering, and neutralizing with chalk and quicklime, by which citrate of calcium is precipitated. This, by decomposition with sulphuric acid, gives the acid, which is then purified by repeated crystallization. Several improvements have of late been introduced, both in preparing the crude lemon juice for exportation and in the subsequent purification and crystallization of the acid. Citric acid is white when pure; it crystallizes in two forms, one belonging to the trimetric system is the common form, and in it the acid contains one molecule of water, as indicated in the formula given above. The other form contains half the quantity of water. The ordinary crystals effloresce in the air in a warm room. Citric acid has a pleasant sour taste. It dissolves very readily in water, and is soluble in alcohol, but insoluble in ether. When heated it undergoes decomposition, and yields aconite, itaconic, and citraconic acids, along with other products. It is acted on by nitric and sulphuric acids, and by other reagents, yielding a variety of decompositions and derivatives.

Citric acid combines with the metals, forming citrates. They are crystalline salts, and many of them are soluble in water. Crude citric acid is largely employed by the calico-printer as a resist and as a discharge.

Citric acid and the citrates are used in medicine as cooling drinks, as antidotes to alkalies, and for the purpose of rendering the urine alkaline, thus overcoming too great an acidity. Citrates of magnesium are used as laxatives and cathartics, and are among the most effi-

cient and pleasant of this class, being particularly adapted to children.

Citron (*Citrus Medica*, var. *genuina*), a bush or small tree of the natural order *Rutaceæ*. It bears reddish or purplish slender branches; smooth, oblong leaves; externally reddish flowers; and large, warted or furrowed, oblong or ovate fruits with a very thick, tender, aromatic rind, which is candied or preserved and used in cakes or confectionery. The mildly acid juice of the pulp is used to some extent with sugar and water as a drink like lemonade, or for mixing with and flavoring various liquors. From India, where the tree is native, the citron has been introduced into many warm climates throughout the world. It is sparingly cultivated in California and southern Florida, but more generally in the West Indies more as a home than an orchard fruit. Most of the candied citron on the American market comes from the Mediterranean region of Europe, where the trees are extensively cultivated. All the varieties, which vary considerably, probably on account of hybridizing with other species, are very susceptible to injuries by frost. They may be propagated by layerage, graftage, or cuttage, the first producing trees inferior in form to those derived by the other two methods. The orchards should be located on well-drained land well exposed to sun and air, which aid in preventing the attacks of insects and fungi. Clean cultivation, liberal fertilization, and the use of cover crops during the hot months, are the three leading factors in the cultivation of this crop in Florida. In the United States, the name is also popularly applied to a variety of watermelon with an edible flesh and generally red seeds. This citron is frequently grown in northern private gardens and to a small extent commercially for its rind, which is used for preserving in various ways. See LEMON; LIME; WATERMELON.

Citron-melon. See WATERMELON.

Citronel'la Oil, an oil obtained from a kind of grass (*Andropogon nardus*), cultivated at Singapore and in Ceylon. It is used for scenting soaps. Other species of the same genus and some other allied genera also yield essential oils.

Citronelle, sīt-rō-něl', Ala., a village in Mobile County, where on 4 May 1865 the last Confederate army east of the Mississippi surrendered to the Federal troops under Gen. Canby.

Citronwood, or **Citrus-wood**, the most costly furniture wood of Roman antiquity, usually regarded as derived from *Biota* (*Thuja*) *orientalis*, or possibly from *Callitris quadrivalvis*, allied coniferous trees, both popularly known as *Arbor vitæ* (Oriental and African). Cicero is said to have paid an enormous sum for a table of this wood.

Città Vecchia, vĕk'kĕ-ä, or **Civita Vecchia**, a fortified city of Malta, near the centre, and almost on the highest point of the island, seven miles southwest of Valetta. Pop. 7,000.

Cittadella, chĕ-tä-dĕl'lä, Italy, city in province of Padua, compartimento of Venetia; 30 miles northwest of Venice. Portions of its ancient walls still remain. It contains beautiful churches and botanical gardens. Its mod-

CITY

ern industries are the manufacture of paper and linen. Pop. 9,850.

City (Latin *civitas*). The Greeks and Romans distinguished a city from a town, or mere assemblage of people living together under municipal laws, as an independent community or state possessing sovereign authority, and including any portion of the surrounding territory the inhabitants of which possessed the rights of citizenship, but excluding conquered or dependent territories. Thus, Athens, Rome, and Carthage were all both towns and cities in different senses. In Europe the word city came to have two meanings, the one civil, the other ecclesiastical. The civil meaning corresponded with the Roman sense, in which the great Italian republics and the German free cities during the period of their independence corresponded with it. The fluctuations in the fate of such cities must necessarily have caused the word to lose the sense of territorial independence, and this change would be promoted by the rise of rivals to them in other respects having no such claim, so that in modern times a city has come to signify merely a town holding from extent of population, favorable situation, or other causes, a leading place in the community in which it is situated. The ecclesiastical sense of the term city is a town which is the see of a bishop. This seems to be the historical use of the term in England, and still possesses some authority there, but in general use it has been superseded by the wider one. In our historical retrospect we take the term in its least restricted sense. The origin of cities belongs to the earliest period of history. According to Moses Cain was the first founder of a city, and Nimrod built three, among which Babylon was the most important. The Jews imagine that Shem erected the first city after the deluge. At the commencement of society the form of government was patriarchal. The ruler was the head of the family or clan. Relationship, the innate wish of men to live in society, and more, perhaps, than both these causes, the necessity of providing means of defense against more powerful clans, brought together separate families into one spot. The fertility of the East also afforded facilities for men to give up the rambling life of nomads and to form permanent settlements. These settlers began to barter with those tribes who continued to wander with their herds from place to place. Thus cities sprung up. These were soon surrounded with walls to prevent the inroads of the wandering tribes. The bond of connection between their inhabitants thus became closer, and their organization more complete. As by degrees the chiefs of these family-states died away, the citizens began to elect the most able or most popular men for magistrates, without respect to birth or descent. Thus political institutions began to assume a systematic character. The earliest forms of government succeeding the patriarchal state was probably monarchical. In this the religious, paternal, and political authority remained rudely mingled. When conquest extended the limits of these early kingdoms the authority of the king was weakened, his connection with the different parts of his dominions became imperfect, and the progress of civilization was promoted almost solely by the growth of the cities. These

gave rise to the division of labor, the refinements of social intercourse, the development of laws caused by the conflicting interests of many people living close together, the idea of equality of rights, the diminution of awe for a distant monarch, the growth of patriotism, springing from the sense of advantages enjoyed and the exertions necessary to maintain them. These were the salutary consequences of the establishment of cities. Under the mild sky of Asia, Africa, Greece, and Italy cities were built first, and in the greatest number. The Phœnicians and Egyptians particularly distinguished themselves by the erection of cities, which soon attained a high degree of wealth, and consequently of civilization. The Egyptians considered their city of Thebes older than any of the Greek cities; and Pliny says that Cecropia, said to have been erected in Attica by Cecrops, 1582 B.C., and afterward called "Athens," was the oldest city of Greece. Heeren justly remarks that the rise of cities was the most important source of the republicanism of antiquity. This is particularly true of Greece. In fact cities are, by their very nature, of a democratic tendency. Several confederations of cities existed in the ancient world; for instance, the Phœnician, consisting of the cities of Tyre, Sidon, etc., and the Achæan league, formed by the most important cities of Greece, in order to strengthen themselves against the power of Macedon. Under Augustus and his successors the Romans began to establish colonial cities in Germany, having done the same long before in Gaul, Spain, Africa, etc. In Switzerland they first erected cities about 70 A.D., which, however, were mostly laid waste by the Alemanni, and subsequently rebuilt under the government of the Franks (496 A.D.). The Germans, accustomed to a wild, rambling life, did not show any disposition to live in cities until Charlemagne labored to collect them together in settled abodes from his desire to civilize them. Henry I. distinguished himself particularly in this way, and on this account has been called by some "Henry the City-builder" (*der Stadterbauer*). He gave the cities great privileges, in order to induce his subjects to live in them, and thus laid the foundation of that power which at a future period contributed most to break down the feudal system. In many cities imperial castles were erected to protect the inhabitants, and the insupportable oppressions and even cruelties exercised by the feudal lords upon their peasants, or by the wandering knights and robbers, drove many people into the cities. The attacks of the neighboring lords gave firmness to their union, and compelled them to cultivate their resources. Commerce and the various arts and trades were soon cultivated within their walls, and their wealth and respectability increased. They soon became sensible of the want of a better system of laws and political administration than prevailed around them, and the principle of equal rights and laws was quickly developed.

One of the most important remnants, if not the most important, of the great fabric of ancient civilization, was the cities of Italy. In spite of their bloody contests with each other, and the vices of an oligarchical government, Europe is mainly indebted to them for the cultivation of the commercial spirit, together with the toleration and love of liberty, which, under

CITY

the most unfavorable circumstances, it tends to foster, and for that ardor in the cultivation of arts, science, and literature, which has always distinguished the best periods of Italian history, and from which the general revival of learning in Europe, called the Renaissance, took its rise. Under the reign of Conrad III. (1138-52) the cities of Lombardy, and particularly Milan, which stood at their head, had acquired a high degree of wealth and power, and had formed themselves into a confederation. The struggles between the emperors and these cities form one of the most important portions of the history of the German empire and of Italy. Frederick I. in vain demolished the powerful city of Milan. It was soon rebuilt, and the cities of Lombardy, in alliance with the Pope, obliged the emperor to conclude with them a very disadvantageous peace at Constance. Two other confederations of cities, highly important, were formed during the interregnum of the German empire, between 1256 and 1272. One of them was the powerful Hansa, or Hanseatic League (q.v.), the other the confederacy of the High German and Rhenish cities, from the foot of the Alps to the mouth of the Main, established by Walpode of Mentz in 1255. A similar confederacy, and a very important one, was that of the Suabian cities, instituted in 1488 to repel the outrages of the feudal lords and knights. The cities of the Netherlands, from their central position between France and Germany, exercised a powerful influence on the growth of civilization and political liberty in Europe. Their favorable situation and the enterprise of their inhabitants early gave them great wealth and power. The democratic spirit, ultimately carried to the greatest height in Holland, was earliest manifested in the towns of Belgium, which began in the 12th century to manifest a turbulent disposition, and by frequently leaguering themselves with the enemies of their feudal superiors extended their political privileges, and acquired at times a premature independence, which, though ultimately extinguished in the spirit of nationality, contributed not a little to the breaking up of the feudal system (q.v.). In Spain municipalities were established at an early date. Leon received a charter in 1020, Sepulveda, Lograno, Sahagun, and Salamanca followed soon after. The constitution of the Spanish towns approached more nearly to the ancient idea of a city than was common in other large states of Europe, in this resembling the Italian cities. Their constitution was extremely democratic, and they ruled over a large extent of surrounding territory, which they were bound to defend. Deputies from the towns were admitted to the cortes in the 12th century (1167 and 1188). The love of liberty rose high in these ancient Spanish cities, but from the isolation of the Iberian Peninsula they exercised little influence in Europe, and they soon lost their power and importance, most of them by the end of the 15th century having ceased to send their representatives to the cortes. By degrees the cities acquired in the different countries of Europe the right of representation in the legislative bodies; and wealth, industry, knowledge, and equal laws spread from them through Europe. But the cities of Lombardy, though still flourishing and wealthy, had fallen, for the most part, under the rule of single families; their republican gov-

ernments vanished, and their confederation was dissolved. The associations of German cities experienced a similar fate. By the Peace of Westphalia the princes of the German empire were declared sovereign powers, and the more their authority increased the more did the relative weight of the cities diminish. These had formerly suffered from the oppressions of the feudal lords. They were now the victims of the policy of the neighboring princes, whom envy often led to adopt the most unwarrantable measures against the cities, many of which had lost their independence before Napoleon dissolved the German empire. He took away the privileges of those which remained free; and the Congress of Vienna restored freedom to Lübeck, Hamburg, Bremen, and Frankfort, only because the different powers could not agree to whom they should be assigned. At the same time Cracow was declared an independent city, with a republican form of government.

Cities, as we have seen, naturally develop the democratic principle, and on this and several other accounts are to be considered among the firmest supports of liberty. Well-organized municipal institutions, in which the government is in the hands of the citizens, afford continual nourishment to the spirit of freedom throughout a country.

In the United States a city is an incorporated municipality, usually governed by a mayor, alderman, and common council. In many of the States, especially the eastern, the number of inhabitants required for legal municipal incorporation is 10,000. In several of the western States a much fewer number is required. A village or town of 10,000 or more inhabitants is not obliged to become a city, and in several cases places of 20,000 and 30,000 have preferred, for local reasons, to remain under village government. In the United States cities are generally the outgrowth of villages, one village expands into a town with population sufficient to assume the duties of a city; but in several instances, villages near each other have united to form a city, and sometimes cities nearby have united in one municipality.

Much has been said and written upon the immorality of large cities, and it cannot be denied that they have vices peculiar to themselves; but it must be considered, on the other hand, that they are free from many of those of petty towns, and even of rural districts. The association of men in masses, when due surveillance is exercised, has an influence distinctly favorable to the maintenance of social order, the impartial administration of justice, and, above all, the suppression of all petty and local tyrannies, and the maintenance of individual liberties. It is by the influence of cities alone that a sufficient organization for the support of education and the means of enlightenment is obtained, even though that organization often fails to penetrate the entire mass of the cities themselves. It is to them that many of the facilities for progress in art and science are due. It is in them that public opinion is formed, and so organized as to act upon the administration, and, even independently of direct representation, upon the legislation of a country; and although the individual freedom enjoyed in great cities may often tend to license, its general influence in an otherwise healthy community is highly beneficial to the moral tone of the whole. It must, however, be

CITY-MAKING

admitted that the democratic spirit in cities is liable to be carried too far, and that an excessive growth of large towns might thus prove dangerous to the State.

As regards mortality, New York compares favorably with most of the larger European cities, of which St. Petersburg and Moscow have the highest death-rate (29 or 30). Cities in Great Britain and Canada seem to be much on a par with those of the United States. Asiatic cities stand much higher. See MORTALITY.

City-making.—Although in the history of the world, cities have occasionally sprung up by fiat and have thus been deliberately planned, giving scattered examples of practical city-making on a large scale and more or less satisfactory in character, the rule remains that most have usually grown by extension and accretion from smaller communities, and their growth has had no other law than the requirements of the moment and the unorganized practical and æsthetic impulses of individuals and corporations. The units of a community have always, indeed, united for common ends, but rarely with a conscious regard for a civic ensemble, and still more rarely with regard to the necessity of preserving to the community the means of further extension on lines foreseen toward a larger whole, of which the existing city should be a concrete and vitally related part. The surge of the population toward the great centres which has marked the rise of the industrial spirit and the enormous growth of the cities in the United States and Germany has brought the subject into clear prominence, and for the first time in history science has seized on this field and endeavored to trace the natural laws and phenomena of civic life and civic growth, and to point out to the practical worker the condition of his problem.

The modern science of city-making, then, has sprung up in answer to a manifold need in the cities of to-day. From the reorganization of the entire plan of a city like that being undertaken by the city of Washington, D. C., to matters of the discipline of the street in one form or another, its principles are becoming more and more clearly recognized in the minds of the people, and in the laws and regulations that are its outcome.

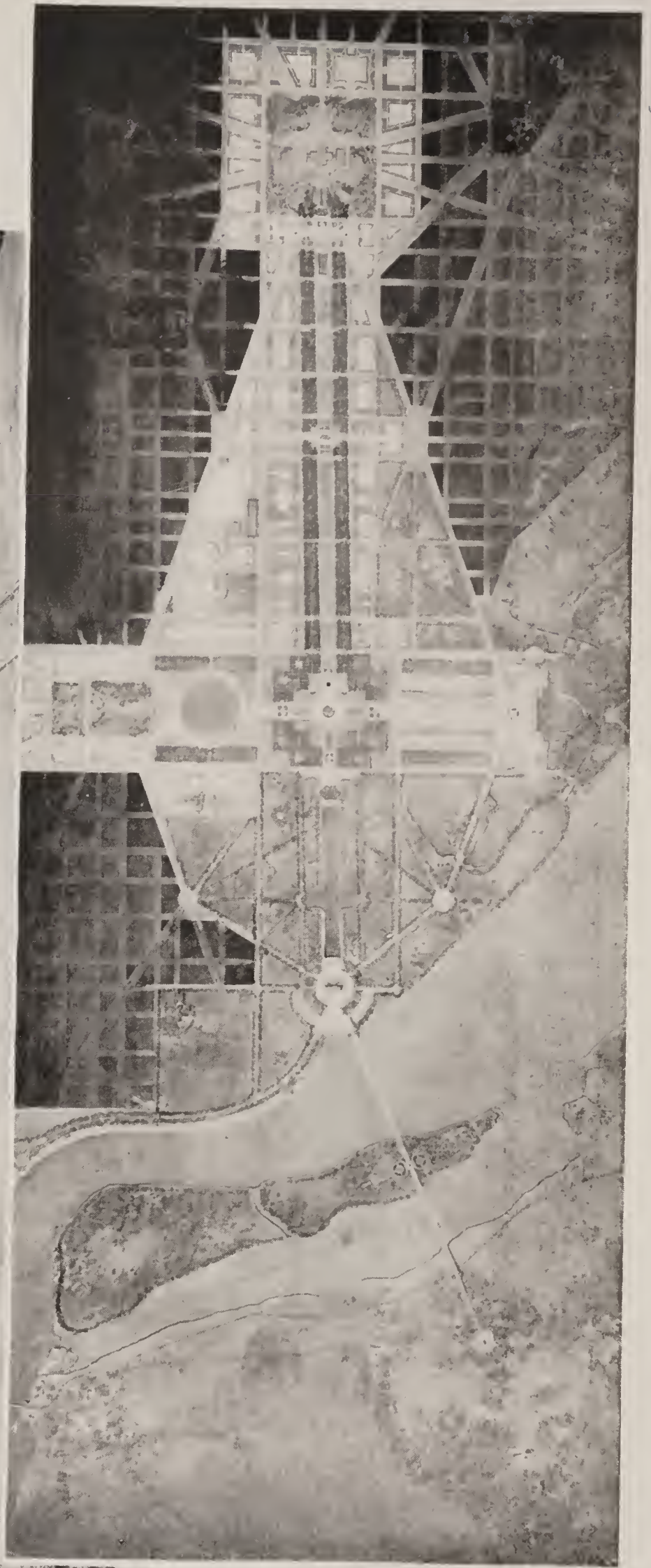
In the extension and widening of streets which, as originally planned, were too narrow for the traffic that has surpassed the hopes of the early founders, and in the parking treatments by which we try to counterbalance the aridity of the unbroken stone and brick, we have one of its fields which is most obvious. Another is seen in the growing sentiment that the fixtures on our streets must not be merely functionally suitable, but should also be at least neat in design and quiet in color, if they cannot have positive ornamental value. Along this line may also be mentioned the desire, on æsthetic, as well as practical grounds, for the burying of wires and the clearing of our streets of the forest of poles so destructive to the architectural beauty of a city. In the improved disposal of garbage and in street cleaning, a somewhat stronger position has been early assumed from the direct practical necessities of the case. It is in spacing and the insuring of breathing spots in our cities that a haphazard and unscientific method, one, indeed,

almost of accident, is to be clearly observed. No city of any importance is without its parks, but few have a park system, and in few cases is there evidence of anything but chance in their location. The science of city-making touches on questions of the control of private action at a number of important points. For instance, in Massachusetts, the trees along the sidewalk are considered so far a public benefit that the public interest in them is held to exceed that of the owner, and he may not remove or injure them except by official permission. In the attempt to restrain the voiding of immense clouds of bituminous smoke into the atmosphere, we have another example in point. The municipal oversight of architectural designs in this country, chiefly restricted to constructional features, is in foreign countries extended to a municipal oversight of designs from the architectural standpoint, and this which might, in certain cases, prove a source of tyranny, has, like all similar regulations, a counterbalancing advantage to the community. In the municipal control of posters and signs we again see the same readiness to defend the citizen on grounds of morality or from the danger of falling signs, but we must still look abroad, except in a few isolated cases, for an official expression of the growing conviction that on artistic grounds, as well as for the good of the general neatness and dignity of the city, there should be restraint on artistic grounds also. In functional matters, in the disposal of sewage, in all matters of construction, there is little need for other than a more exact and logical application of principles already well thought out, but in the employment to advantage of the city's physical opportunities, and in the expression of a municipal pride at all commensurate with the pride which every citizen feels in his own personal domain, we are yet in the early stages of development. How far we have still to go can best be judged by the advance that has already been made at isolated points. Governmental and municipal buildings are being more monumentally handled. They are being protected in some measure from private encroachment. Water supply systems have in more than one instance given handsome buildings, and in at least one case ornamental reservoir lakes.

In municipal pageantry our cities have taken a great step forward in the last 10 years. The various local celebrations that took place at the close of the Spanish war are an example in point, and while we have not yet the extensive paraphernalia such as belongs to almost every considerable city on the other side of the ocean, our cities at least own the nucleus of a collection of civic ornaments for use on occasions of public festivity. Hygiene, on the other hand, has been a powerful appeal. Our regard for it has opened up breathing spots like that at Mulberry Bend in New York, and it is natural that moral and ethical grounds should have taken precedence over the æsthetic.

The history of the modern movement as a conscious scientific effort begins with the work of Louis Napoleon and George Eugene Haussmann in Paris, who, a year after the proclamation of the second empire, decided on the first great and comprehensive scheme of modern city-making. In the following years a scheme of urban development was carried out in Paris which still remains an unsurpassed object les-

CITY MAKING.



PLAN AND BIRD'S EYE VIEW OF A PROPOSED ARRANGEMENT FOR WASHINGTON, D. C.

CITY-MAKING

son. Under Haussmann's administration the movement achieved remarkable results, and being in a position to assume title to the improved areas, the increase in values was in large measure preserved to the community and a clear demonstration was made of the fact that such gigantic civic improvements, far from being costly luxuries, could be made paying investments. As prefect of the Seine he transformed a congested and unorganized centre into the most splendid capital of modern times and created a new profession in which his name yet remains the most eminently distinguished.

It was not until many years after that the Germans began to consider the symmetrical development of cities along equally broad lines, though once their attention was turned to the subject, with customary thoroughness they developed a system entirely their own, so that now nearly every German city of over 25,000 inhabitants has a department in its municipal government devoted to city expansion where all problems of extension and improvement are regulated.

George E. Hooker writes on this subject as follows: "Indeed, the great widening of municipal action in the cities of the fatherland respecting education, recreation, charity, hygiene, and 'municipal trading' is less significant than the attempt to give proper shape, both for economic and æsthetic ends, to the entire physical organization of those cities. The authorities have set up the ideal of a city which, in arrangement and structure, should be a rational unity; and while the results achieved have naturally been limited, they are in many respects surprising.

"Hamburg, for example, could displace 30,000 people in order to obtain a proper location for new docks. Nuremburg, while developing into a modern industrial town, has studiously perpetuated its delightful architectural spirit, and any German city which should to-day lay out or permit to be laid out, a new quarter on the easy and wearisome checkerboard plan would be laughed at. There have actually developed in Germany—and in Austria, too—especially during the last dozen years, the rudiments of a real science of city-building, with a limited but distinctive literature of its own."

The appearance of Dr. Albert Shaw's books on municipal government in 1895 gave a distinct impetus to the municipal improvement movement in this country. His painstaking accounts of organic development in many foreign cities and the methods by which they were brought about, created widespread interest, starting a wave of popular enthusiasm and activity, which is evinced by the numerous associations with large and influential membership to be found in almost all progressive centres in the United States.

Among the pioneers in the work was the elder Olmsted, who did much to reclaim numbers of bare spots in American cities and might be considered the father of American parks, although he never carried his work so far as did one of his disciples, the late Charles Eliot. It was Mr. Eliot who blazed the way toward metropolitan development by utilizing the barren and squalid outer zones about Boston for a regular chain of parks, and actually, before his untimely death, establishing in and about Boston the most comprehensive system of public

reservations that any city can boast of, including the redeeming of nearly all water fronts both inland and along the sea. Indeed, the extent of the advantages of these reservations to future generations is not to be estimated, as they ensure a certain amount of openness and verdure for all time, notwithstanding the greatest possible increase in population. Boston, thanks to his foresight, is far ahead of any other municipality in the United States in matters of public recreation and health, and has that which no foreign city can rival. Her water supply, including that of over a score of contiguous communities, is protected from pollution by including the entire eastern watershed of Massachusetts, and for the first time reservoirs have been made to do double duty by becoming ornamental lakes, and as such, spots of much interest in the metropolitan system.

The Boston metropolitan park system was not brought about without much agitation, and to Mr. Sylvester Baxter must be attributed much of the success of the undertaking. His far-sighted articles appeared with great regularity and did much to mold public opinion in favor of the undertaking, and as secretary of the first metropolitan park board, he was able to still further assist in the work.

Since that awakening other writers have come to the front, and prominent among them are the names of Mr. Charles Mulford Robinson and Prof. Charles Zueblin. The former's book, 'The Improvement of Towns and Cities,' is a hand-book which has been endorsed by many improvement societies and which, owing to its concise and business-like presentation, is just what is needed by those interested in the development of backward communities. 'American Municipal Progress' by Prof. Zueblin, goes rather into the sociological side and outlines with surprising interest what an awakening has taken place in the United States during recent years, and what unexpected results this awakening has brought forth along lines of physical development.

Among other of the forces that must be recognized as responsible for the force of the movement are the American League for Civic Improvement and the American Park and Outdoor Art Association. The latter is the older, and through the indefatigable efforts of Mr. Warren H. Manning, the landscape architect, it is well established, and by bringing park superintendents together from many cities it has become a real force and has extended its work beyond the province suggested by its title.

The American League for Civic Improvement, not being restricted either in name or endeavor to a group of professional workers, has carried on a broader campaign and through many local organizations all over the country is doing good work.

The first great object lesson of symmetrical development was exemplified by the Chicago Exhibition, where a comprehensive plan was prepared and adhered to. The height of all main cornices was established at an equal level and certain uniform rules applied to the development of the grounds, the buildings and all architectural accessories. Since then more or less successful efforts along similar lines have helped to educate the public at Omaha, Charlestown, Buffalo, and St. Louis.

The Omaha, Charlestown, and Buffalo exhi-

CITY-MAKING

bitions, and particularly the Louisiana Purchase Exposition at St. Louis, with its Municipal Improvement Section, popularly known as the "Model City," the first of its sort to be held in America, have swelled the current. This latter exhibit, under the direction of the writer, brought together results that had proven the nucleus of interest in municipal subjects at the Paris Exposition of 1900 and the Exposition by Municipalities at Dresden in 1903, as well as the exhibits from the United States.

Nevertheless, the recognition of the need for immediate and radical work toward civic betterment finds the nation better provided with

permitted to run the streets at large, and this fact alone hints at others which are not creditable to the sense of civic pride in these communities. It is interesting to note, however, that almost every educational institution has recognized the importance of the movement, and that municipal governments have also been forced to take note of its growth by the extension of those bureaus of administration, the work of which relates to the care and development of the civic domain, and by the appointment of additional officers, such as city architects, foresters, etc., in addition to the engineering force. Moreover, Boston has added a



true-hearted soldiers, anxious to work in the ranks, than with enough good leaders to point the way toward the much-coveted ideal, or even any steps toward it. In a recent article in one of the leading magazines, Mr. J. Horace McFarland gives extracts from letters all over the country, the tenor of which was,—“there is much to do and many who stand ready to do the work, but we need leaders.”

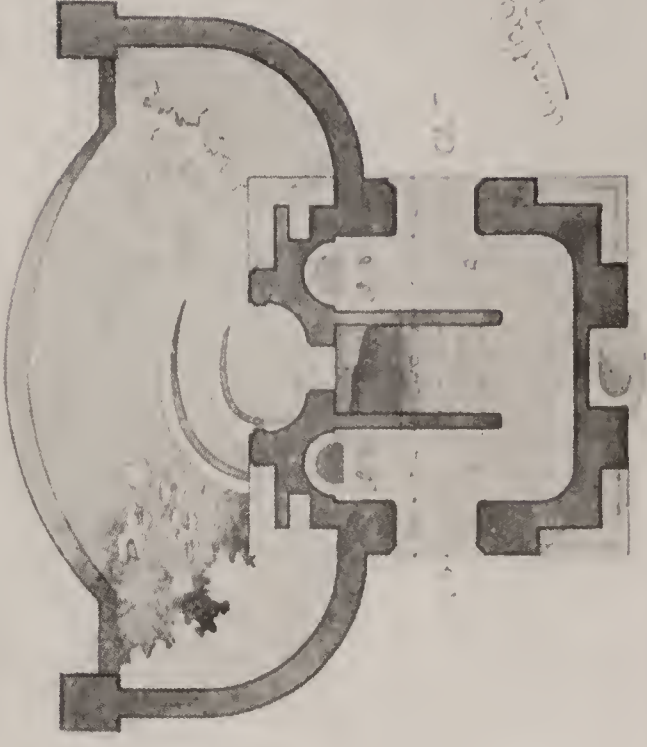
The primitive character of some of the needs proclaimed by the organizers of societies for municipal reform would be amusing, if it did not mirror a state of affairs almost incredible. From several towns we learn that the hogs are

municipal nursery to its civic departments, and thus its verdure has become a matter of as much public concern as the water supply. New York has an architect on bridges, and many park boards now properly insist on having all designs for contemplated improvements prepared by an expert commission, including a landscape architect, an architect, and an engineer.

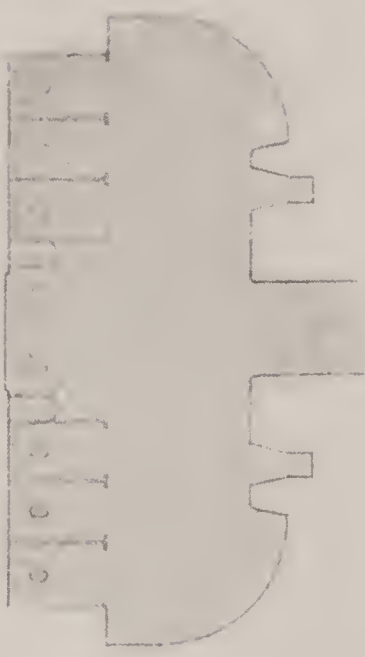
The plan for the embellishment of the city of Washington, prepared by the Park Board Commission, of which Daniel H. Burnham was chairman and Charles F. McKim, Frederick Law Olmsted, Jr., and Augustus St. Gaudens the other members, is at the present writing the



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CITY-MAKING

best illustration of organic city-making actually under way in the country, though other cities, notably Cleveland with its group plan, are following suit.

Two of our illustrations show this plan for the regeneration of Washington, in which, by means of a number of monumental avenues, a series of vistas will be opened up, each with notable foci, such as large public buildings or monuments, by which the city will be given unity of plan and will outrank most cities in ease of access from part to part, and in the magnificence of its public ways. The chief of these avenues will be the new Mall, and it is only proper to add that this is a return to the ideal of the original designer of the city plan, developed on a more magnificent scale and glorified by memorials and architectural masterpieces that have come as the expression of national growth and history.

Another illustration, Figure 3, shows the work that has been done in the neighborhood of Boston, and may be taken as the type of the highest accomplished result in the development of an extended park system in and about a large municipality. The feature of this plan which distinguishes it from all others is the attention given to the future. By acquiring all water fronts, inland and seashore, Boston is gradually extending its park system and improving its waterways for all time. The city as a unit a hundred years hence is being arranged for. In the meantime a metropolitan system of scattered units is rapidly crystallizing.

Other illustrations exhibit in diagrammatic form the possibility which has at more than one point become an accomplished reality, of governing the character of the natural waterways. A river or any water front, whether now given up exclusively to commerce or whether it shows a broad, unhealthy mud-flat on either side, can be easily redeemed. According to the exigencies of the occasion the treatment must vary, but taking the most demanding conditions, it will be seen that the requirements of traffic by rail and water may be much better met if the problem is comprehensively studied, that the logical arrangement of the various structures is economical in every sense, and gives the opportunity to bring the beauty of shaded drives where formerly the conflict of the various enterprises made only confusion and barrenness. Moreover, the river being now confined within vertical banks, the current scours its own bed and the railway and canal are, moreover, protected from inundation. Thus, natural force and inventive planning combine to improve the salubrity, beauty, and revenue yielding power of an area in which private and public interests being at conflict have lost all trace of the beauty that once belonged to them, and which could again be theirs by conciliation of purposes and the expressed sense of interdependence between the various needs of society.

Figs. 5 and 6 are a project for the grouping together of public conveniences, a problem of the utmost importance in the congested portions of cities. In this drawing an attempt has been made to show how, instead of a number of scattered and unsightly units which have no excuse but their utility, the same ends may be efficiently served, while adding to the city a focal point of beauty.

Moreover, such centres, no matter what

form their superstructure may take, should be points from which to thread pipes and wires radiating in all directions, and thus making unnecessary the greater part of the outrageous tearing up of streets, now of so frequent occurrence. Here again can be laid stress on the principal aim of municipal science, which is to replace the haphazard and accidental arrangement of cities with its incalculable waste of time, money, comfort, and beauty by a logical system and arrangement by which the needs can be at least as well met for a city as they now are for even the most complex of single buildings, and in which the various public and semi-public buildings can be so grouped with mutual economy. The transportation facilities of our cities are inadequate and yet wasteful of space, and without due regard to the convenience of the public; yet at no greater cost, by well considered arrangement at the outset, a system of stations and subways could lead to terminal facilities of sufficient capacity and in more direct relation to the requirements of business.

In this connection are to be mentioned the terminal warehouses in St. Louis, where a private company has united the depots of many independent railroads, thus forming a great freight centre, which has proven an isolated but striking lesson in economy. At Algiers, in North Africa, a similar combination exists between the steamship companies and the railroads. The dryness of the climate has here made it possible to use for this purpose huge vaults, above which passes the magnificent Boulevard de la Republic, a combination of utility, economy, and beauty, which should prove a spur to nations which pride themselves on their superiority in other matters.

Mankind has been so long accustomed to the economy gained by uniting for common ends that it seems more remarkable that the question of location, in its relation to the functions assumed by society, has not been more carefully studied. We have municipal hospitals, theatres, libraries, school houses, public baths, and gymnasias, and recreation grounds, from the sand-courts for the smallest children to the ball parks for men, but instead of being made centres of improvement which, as functional centres they should normally be, they are too often ill placed and inadequately arranged.

With regard to school houses this is especially true. There these buildings, so essential to our democratic system, have been erected with regard to an outward appearance befitting their functional character, and have been given that amount of yard space per child which should be made an invariable requirement, as it now is in some places; they have become the centres of local pride and local improvement, and have raised the value of neighboring properties and gone far to reduce local jealousies caused by the placing of those large public works which, unlike school houses, are not the necessity of every ward.

Resolved to its final analysis, the science of city-making appears under the heads of circulation, hygiene, and beauty, and concerns itself with the uniting of these three problems in a scheme of urban life and development in which they shall be fused in a perfection of interdependent and co-related response to the universal needs of man. The conditions of the age, the

CITY GOVERNMENT — CIUDAD JUAREZ

climate and the location, if rightly interpreted, will give it the expression of a perfect and model city in the terms of the given land and people.

ALBERT KELSEY,
Civic Architect.

City Government. See MUNICIPAL GOVERNMENT.

City Point, a village in Prince George County, Va., 10 miles northeast of Petersburg; on the James River and on the Norfolk & W. R.R. It has a trade in brick, lumber, and phosphates, and is of considerable historical interest. Here, in 1864, Gen. Grant made his headquarters, and in his subsequent operations the city was used by the Federal army as its principal landing-place and depot for supplies. Pop. about 1,000.

City Politiques, pŏl'ī-tēks', a satirical comedy, probably printed for the first time in 1683, and produced at the King's Theatre, London, the same year. It was a sharp attack on the contemporary Whig faction, especially on Oates. Only the king's protection kept it from being suppressed by the victims of the satire.

City of Brotherly Love (Gr. *φιλadelphía*, *philadelphia*, *φίλος* *philos*, dear, and *ἀδελφός*, *adelphos*, brother). William Penn gave the English rendering of the two words as the name, Philadelphia, to the city in Pennsylvania. The common rendering into English of the name of the city is "City of Brotherly Love."

City of Churches, a name given to Brooklyn, N. Y., because of the large number of churches in proportion to the population.

City of David, Bethlehem (modern Beit-Lahm, house of bread), supposed to be the birth-place of David, the place where his descendants had to go for the enrollment, when the census was taken by order of the Roman emperor. Jerusalem is sometimes called the "City of David" because he captured it from the Jebusites and made it the capital of his kingdom.

City of Destruction, The. In Bunyan's 'Pilgrim's Progress' Christian begins his journey at this city and journeys to the Celestial City. The place of beginning represents the world with its temptations, and the place of ending, Heaven with its joys.

City of Dreadful Night, The, a poem by James Thompson. In this poem one is supposed to have gone to a city whose inhabitants are gloomy, hopeless, despairing. The hopeless darkness is as the night — oppressive and dreadful.

City of Elms. The large and ancient elm trees which adorn the Green and many of the older streets of New Haven, Conn., have caused this city to be called "City of the Elms."

City of God, The, a noted work by St. Augustine. This, the most important of all the saint's writings, was begun in 413, three years after the capture and pillage of Rome by the Visigoths under Alaric. The pagans had endeavored to show that this calamity was the natural consequence of the spread of the Christian religion, and the main purpose of Augustine is to refute them. The work was finished about 426.

City of Homes, a name bestowed on Philadelphia, from the large number of dwellings inhabited by the owners.

City of a Hundred Towers, a name given to Pavia, Italy, from the many towers and steeples which first greet the traveler.

City of Magnificent Distances, The, a name given to Washington, D. C. When the city was planned, the last of the 18th century, the long and broad streets, with here and there small parks, almost all of which was out long distances in broad fields, caused this name to be given to it in derision. Now its citizens are proud of the title.

City of Oaks, a name given to Raleigh, N. C., from the size and beauty of some of the oak trees which adorn its streets.

City of Palaces, a name applied to Calcutta, India, from the numerous palace-like edifices.

City of the Plague, The, the name of a poem written by John Wilson (Christopher North), published in 1816. It is said to have been founded on the 'Journal of the Plague in London,' by Defoe.

City of the Prophet, a name given to Medina, in Hedjaz, Arabia; the second holy city of the Mohammedans; the place where Mohammed took refuge, in 622, when he fled from Mecca, and the city where he died.

City of the Straits, often applied to Detroit, Mich., from its position. It is situated on that part of Detroit River between Lake St. Clair and Lake Erie.

City of the Sun, a name given to Baalbec, an ancient city of Syria, built on the ruins of the Greek city, Heliopolis, "The Sun City."

City of the Violet Crown, The, a name applied to Athens.

City of Victory, a translation of the Arabic name for Cairo, the capital of Egypt.

City Water Supply. See WATER SUPPLY OF CITIES.

Ciudad, thē-oo-däd' or sē-oo-däd', in geography, the Spanish word for city, from the Latin *civitas*, appears in many names of Spanish places, as Ciudad-Rodrigo, Ciudad-Real, etc.

Ciudad, thē-oo-däd' or sē-oo-däd', in Venezuela, capital of the state of Bolivar, on the Orinoco. Although about 245 miles from the mouth of the Orinoco, it is one of the chief ports of Venezuela. The handsome dwellings, beautiful cathedral, theatre, monuments, and plazas make it a pleasant city. Its chief exports are sugar, coffee, rubber, cattle, hides, asphalt, and cabinet woods. The city was founded in 1764 and was called Angostura. The name was changed in 1819 to its present one in honor of Simon Bolivar. Pop. 12,000.

Ciudad De Cura, dā koo'rä, or **Cura**, Venezuela, in the state of Guzman Blanco, southwest of the city of Caracas, about 20 miles east of Lake Valencia. It is a 17th century city, but many of its new buildings are modern in style and beautiful in architecture. The streets are broad, many small parks adorn the city, and the inhabitants are justly proud of their library. Pop. 12,200.

Ciudad Juarez, hoo-ä'reth (formerly EL PASO DEL NORTE), Mexico, state of Chihuahua. It is on the Rio Grande River, opposite El Paso,

CIUDAD PORFIRIO DIAZ — CIVIC CROWN

Texas, on the Mexican Central R.R., about 210 miles north of Chihuahua, the capital of the state. Altitude about 3,800 feet, country around fertile and producing fruit, grains, and vegetables. Cattle are shipped to various parts of the United States. It has a Mexican custom-house and an army post. A United States consul is stationed here. Pop. 7,200.

Ciudad Porfirio Diaz, pōr-fē'rē ō dē'āth, Mexico, town in the state of Coahuila, on the Rio Grande, opposite Eagle Pass, Texas, on the Mexican International R.R., and is the Mexican terminal of the international bridge across the Rio Grande. It has a custom-house, army post, large cattle markets, and but poor buildings for the storage of fruits or grains. It is situated in an agricultural region, and its trade with the United States consists chiefly in exporting grains, fruit and cattle, and in importing manufactured articles. Coal beds near are of value and may cause the establishing of manufactories. It was founded in 1849. Pop. 5,200.

Ciudad Real, thē-oo-dād' rā-āl', the name of a province of Spain, occupying the south extremity of New Castile, and of its capital. The area of the province is 7,620 square miles. The surface in general is bare-looking, immense plains stretching from the mountains of Toledo to the Sierra Morena. The mountains of Ciudad Real abound in minerals: iron, silver, copper, lead, antimony, cinnabar, and coal; also in quarries of marble, jasper, quartzite, granite, etc. Medicinal and mineral springs, both hot and cold, are abundant. The climate is dry, and in the heat of summer very oppressive. The plains and valleys are productive in the vicinity of the rivers; in favorable seasons good crops of cereals are obtained. Cattle, sheep, mules, etc., are reared. Woolen, linen, and other fabrics, hardware, earthenware, esparto, etc., are manufactured; brandy, wine, and oil of good quality are made. Metals, manufactured goods, brandy, wine, and oil, horses, mules, and cattle are exported. The city of Ciudad Real is situated on a low plain near the Guadiana, 100 miles south of Madrid. The walls are in many parts ruinous. The principal edifices are the Church of Santa Maria del Prado, consisting only of a single nave, but so grand and lofty that no other in Spain, except the cathedral of Coria, equals it; the hospital; the institute, with a good laboratory and botanic garden. The manufactures and the trade are of little importance—the former in woolen and linen cloths, the latter in grain, wheat, wine, etc. Pop. about 15,000. Pop. of the province (1900) 321,580.

Ciudad Rodrigo, rōd-rē'gō, Spain, a fortified town in Leon, on the river Agueda, about 55 miles south-southwest of Salamanca. There is a castle dating from the 13th century. The cathedral was begun in 1190 and contains many interesting features. Ciudad Rodrigo was a place of considerable importance in early Spanish history as a frontier fortress. It was taken by the English in 1706 during the war of the Spanish Succession, and recovered by the Spaniards in 1707. The fort was surrendered to the French under Masséna, 10 July 1810, having been bombarded 25 days; and 19 Jan. 1812, it was taken by storm by the British under Wellington, after a siege of 11 days. The Cortes bestowed upon Wellington the title of Duke of Ciudad Rodrigo. Pop. 8,000.

Ciudad Victoria, sē-oo-dād' vīk-tō'rē-ā, Mexico, capital of the state of Tamaulipas, on the main line of railroad which runs from Tampico to Monterey, about 100 miles from the Gulf coast. It is in a sugar and fruit-growing region, but the sugar only is exported. It is an episcopal see and the residence of a consular agent of the United States. The city was founded in about 1750. Pop. 14,800.

Ciudadela, thē-oo-dā-dā'la, Spain, a city and seaport on the island of Minorca, at the west side. It is surrounded by walls and a ditch, and has a cathedral, municipal buildings, hospital, cemetery, and several convents. The inhabitants are engaged in weaving woolen fabrics, expressing oil and wine, and in husbandry. Pop. 8,447.

Civets, a family of small carnivorous mammals, the *Viverridæ*, related to both the hyenas and the cats. Their alliance to the former appears when the fossil history of the family is traced back to the early Tertiary, where the ancestry of both converges. The comparatively coarse hair, erectile mane, possessed by some species, and dentition, are still hyena-like; while the slender, elongated form, long tail, and especially the fact that the claws are semi-retractile, exhibit the inborn likeness to the cats. The civets vary from two to three feet in length, and most of the species are strongly marked in black and white stripes and spots, sometimes prettily disposed. They are distributed throughout the warmer parts of the Old World, abounding in Africa and the Malayan Islands, but are absent from the Australian region. The family is divisible into two groups, one of which includes the typical civets; the African genets (q.v.), one species of which also inhabits Spain and Italy; the linsangs and other Oriental spotted forms, and the paradoxures. The second group includes the mungoos and other ichneumons, suricates, and the like. These various forms will be found described elsewhere under their separate names.

Civets feed upon smaller mammals, birds' eggs, lizards, and snakes, and are considered beneficial because of their appetite for crocodile eggs, which they devour in great quantities along the Nile. They are characterized by, and chiefly valued for, an odorous, fatty substance, contained in a pouch connected with the sexual organs, in both sexes. This substance is used for compounding perfumes, and is ready for use after it has been drained, washed and dried. It is called "civet." A dram is obtained at a time from each animal, from which it is taken at intervals of a few days. Many thousand ounces are annually imported into London. Pure civet is valued at about \$10 an ounce. The American "civet-cat" is the cacomistle (q.v.), which is not a true civet, but nearly related to the raccoons.

Civic Crown, among the Romans, the highest military reward assigned to him who had preserved the life of a citizen in battle. It bore the inscription *Ob civem servatum*, that is, "for saving a citizen," and was made of oak leaves. He who was rescued offered it, at the command of his leader, to his preserver, whom he was bound to honor afterward as a father. Under the emperors it was bestowed only by them. The person who received the crown wore it in the theatre, and sat next the senators.

When he came in all the assembly rose up as a mark of respect. The senate granted to Augustus, as a particular mark of honor, that a civic crown should be placed on the pediment of his house, between two wreaths of laurel, as a sign that he was the constant preserver of his fellow-citizens and the conqueror of his enemies. Similar honors were also granted to the Emperor Claudius.

Civics, the science which deals with the theoretical and practical aspects of citizenship; the duties of citizens to each other as fellow members of a body politic, and to the government. In its broadest aspects it includes civil law, political economy, and finance, as well as social ethics, governmental methods, and the history of social and political development; but the first three are counted as separate sciences from their extent and specialty, and civics proper is concerned with the last three. This is becoming a recognized study in the schools and colleges of the United States.

Cividale, chē-ve-dä'lā, Italy (the ancient FORUM JULII), a town of Venetia, in a basin of the Julian Alps, eight miles east-northeast of Udine. It consists of the town proper, surrounded by walls and ditches, and of fine suburbs; and has among its edifices a large cathedral of the 15th century, with three Gothic portals, a curious baptismal font, and several fine paintings; a museum of antiquities, and a record office with some very ancient charters. The neighborhood abounds in interesting antiquities. Pop. about 9,000.

Civil Action, an action brought in the civil courts for the recovery or protection of private or civil rights, or damages for their breach. The two great classes into which actions are divided are civil and criminal. In civil actions either a government or a private individual may be plaintiff or defendant; while criminal actions are always brought in the name of the government.

Civil Damage Acts, legislative acts passed in several of the States, giving to husbands, wives, children, parents, guardians, employers, and others who have sustained injury in person or property or means of support, by an intoxicated person in consequence of such intoxication, the right of action against the person who sold or gave away the liquor which caused such intoxication. Such acts have been held to be constitutional. In some cases the right of action has been extended to the owner of the premises where such intoxicating liquor has been obtained.

Civil Death is where a person, although possessing natural life, is on account of some crime for which he has been convicted, sentenced to life imprisonment, and thereby lost all his civil right, is considered in law, dead. In some jurisdictions a person convicted of murder and sentenced to life imprisonment is considered in law as dead.

Civil Engineering. See ENGINEERING, CIVIL.

Civil Law, The. 1. *Introduction*.—The term Civil Law (*Jus Civile*) is commonly and popularly used in several distinct senses. Thus we distinguish it on the one hand from the *Jus Gentium* and on the other hand from the *Jus Naturale*. Again our municipal law is called the civil law, and further we distinguish between

civil and criminal law on the one hand and civil and canon law on the other. But it is here used as referring to the whole body of Roman law (the *Corpus Juris Civilis*), having its proper origin contemporaneously with the genesis of the Roman state, and coming down in ordinary generation, from century to century, through the regal period, the republic, and the empire to the codification of Justinian and Napoleon.

When we speak thus of the Civil Law we mean the whole system of usages and rules of private law adopted by the Roman people; their *jus privatum* as opposed to their *jus publicum* (including criminal and sacred law). The *Corpus Juris Civilis* as left by Justinian was the result of a gradual modification and enlargement of the code of the XII Tables under three great influences—the Jurisconsults, the Prætors, and Legislation. The institutional definition of the *jus civile* as the peculiar law of Rome, in contrast with the *jus naturale* and the *jus gentium* is a mere philosophical flourish; by late writers *jus civile* was confined to the *responsa prudentium* alone; what the Roman jurists had chiefly before their mind when they used the expression was the old law of the XII Tables, as contrasted generally with the newer development of the *jus honorarium* (Hunter, Roman Law, 24).

Thus the Roman law presents two aspects, each perhaps equally deserving the attention of the student of jurisprudence. From one point of view it furnishes the sound and scientific basis of the greater part of the modern law of all civilized mankind, and has long proved an inexhaustible storehouse of legal principles. On the other hand, it forms a connecting link between the institutions of our Aryan ancestors and the complex organizations of modern society. In its ancient records it takes us back to the very inception of civil jurisdiction, and tracing it down for more than 2,500 years from the Rome of Romulus and Servius Tullius, we see it constitute a legal development not matched in the history of the law of any other people. The oldest fragments of the Roman law that have come down to us are ascribed to the period of the kings, but these are essentially traditional and practically insignificant, and we take the XII Tables as the first solid ground in the history of the Civil Law.

2. *The Law of the XII Tables*.—About the year 450 B.C. a commission from Rome visited Greece for the purpose of collecting information necessary to draw up a written code of laws. This fact suggests a foreign or Greek extraction for at least a part of the oldest body of Roman law, although it must of course be conceded that the XII Tables undoubtedly contained much law of indigenous growth. Three centuries had intervened between the founding of the city and the promulgation of the law of the XII Tables. During this period a certain body of local, customary law had inevitably developed, some part of which must have been incorporated into this first written code. Until the time of Diocletian (245–313 A.D.) professional lawyers, strictly so called, were not known in Rome. The business of practising law, so to speak, had been up to that time regarded as a public office, which each citizen might be called upon to undertake; but about that time there began to grow up in Rome a class of men among the patricians who made it their busi-

CIVIL LAW

ness to know the law. Pomponius in his history of the Roman law, written about the middle of the 2d century A.D., informs us that the custody of the XII Tables, the exclusive knowledge of the forms of procedure and the right of interpreting the law belonged originally to the College of Pontiffs, a patrician order, at the head of which was an officer known as the Pontifex Maximus, from which office it may be remarked in passing, indirectly and by a strange and circuitous devolution has come down to our day the office of the Pope in the Roman Catholic Church. Only a small part of the language of the substantive law of the XII Tables has been transmitted to our time. Some learned attempts have been made to patch out the substance of each table, but it is by no means certain that the exact fragments of any part of the XII Tables have come down to us in their precise original form and expression. The language has probably been essentially modified by the subsequent Latin usage and by repeated transcription; and the fragments have had to be picked out and pieced together from numerous references in the later literature, as for example from Cicero, Dionysius and Gaius; so that, as matter of fact, what passes for the substance of the XII Tables is probably largely a speculative patch-work, and in its content and significance certainly more or less misleading.

3. *The Jurisconsults and the Prætors.*—The Jurisconsults, a professional class of jurists or legal writers dating from the century before Christ, were given by Augustus an authority and standing which they had not theretofore possessed, and from his time much weight is to be attached to the opinions and writings of the more eminent of them. In 426 A.D. Valentinian enacted a law, commonly called "the Law of Citation," providing that the writings of only five jurists,—Papinian, Paul, Gaius, Ulpian, and Modestinus, should be quoted as authorities. If a majority of these held one opinion, that was to bind the judge; if they were equally divided, the opinion of Papinian was to be adopted. The great bulk of Roman law as it has come down to us, and all that is most valuable in it, is due to the jurisconsults. The Prætor stood in Roman law midway between the jurisconsults and the legislature. At first there was but a single Prætor, but later a Prætor-Urbanus and a Prætor-Peregrinus (when the empire extended beyond Italy, the number being increased to 18), dividing the jurisdiction among them generally either along the line suggested by their names, or territorially. The Prætor exercised a qualified or limited legislative power. His right to alter the law was conceded, but it was not unlimited. He was in some sort the Chancellor, the keeper of the conscience of the Roman people, or the person who was to determine in what cases the strict law was to give way to natural justice (*naturalis æquitas*).

4. *Legislation.* — To give an adequate account of Roman legislation would be to write the constitutional history of Rome, something quite beside the purpose of this article. It is important, however, to state that during the republic the popular assembly was the foundation of legislation. During the earlier part of the empire the function of the popular assembly was gradually usurped by the Senate, acting more and more as the mere mouth-piece of the emperor. Finally even this form was dropped, and

all enactments were made directly by the emperor. During the republic three assemblies of the Roman people existed,—the *Comitia Curiata*, a patrician body, the *Comitia Centuriata*, composed both of plebeians and patricians—the franchise being on the basis of a property qualification—and the *Comitia Tributa*, which was based on a local division of the people of the city—the vote being given territorially, as if by arrondissements, cantons, or wards. The sovereign power was exercised by the emperors in three ways,—(1) by direct legislation (*edicta, constitutiones*); (2) by judgments in their capacity as supreme judge (*decreta*); and (3) by *epistolæ* or *rescripta*, giving instruction on questions of law in answer to applications from the judges.

5. *Codification.*—The earliest collection of law in Rome was the *Jus Papirianum* of the regal period (*temp.* Tarquinius Superbus), and it was not until 304 B.C. that the full knowledge of the law was wrested from the patricians. The constitutions of the emperors were collected at different times and constituted the first codes. The oldest collection in the form of a code is the *Codex Gregorianus et Hermogenianus*, which covers a period of 200 years from Hadrian to Constantine. Only fragments of it remain. Next we have the *Codex Theodosianus*, made about the year 435 A.D. The Theodosian Code has small pretensions to scientific classification, but it runs to 16 books and has come down to us almost complete. The reign of Justinian (527–565 A.D.) marks the culminating period of Roman law. In collaboration with Tribonian, he prepared, or caused to be prepared, a complete codification of the whole body of the law, first appointing a commission of 10 members to draw up a Code along the general lines of the Theodosian Code. This is called the *Codex Vetus*, which was speedily superseded by a later edition and has been entirely lost. Next, about the year 530 A.D., Justinian created a commission of 16 members to collaborate with Tribonian in a codification of the vast accumulation of law that had grown up under the hands of the Jurisconsults and the Prætors. The commission had to deal with the works of 39 jurists, consisting of 2,000 books and 3,000,000 verses. This matter was finally sifted and reduced to 50 divisions or books, and constitutes what we know as the Digest and the Pandects. For the purpose of providing an elementary or preparatory text-book of the law, a commission was further constituted by Justinian, which prepared the Institutes of Justinian, which are in some sort a little more than a revision or a new edition of the Institutes of Gaius. After publishing the Pandects and the Institutes in 534 A.D., a commission was appointed to revise the old code and to incorporate the new constitutions and decisions. This revision was completed in the same year, and promulgated on 16 Nov. 534 A.D. Laws of a permanent character, subsequent to Justinian's codification, were collected from time to time and called Novels.

6. *The Justinian Law in the West.*—Upon the fall of the Western Empire and the subsequent local disorder and social disintegration throughout western Europe, the civil law fell into disuse in the West, and during the Middle Age was largely lost sight of; but in the 12th century the study of the Civil Law was revived at Bologna and spread thence throughout Italy

CIVIL LAW

and into France. In 1453, about nine centuries after Justinian, Constantinople was taken by the Turks and the Eastern Empire was overthrown. During some five centuries, or more than half of the existence of the Eastern Empire after Justinian, the law nominally remained as settled by Justinian's legislation, modified indeed by subsequent novels of the emperors; but about the end of the 11th century the Justinian Code fell into abeyance without special abrogation. The great causes of its decay were the change of language from Latin to Greek, the accumulation of fresh law and of commentaries, the authorized readjusting of the whole by several of the later emperors, and the overpowering influence of the ecclesiastical or the canon law. The revival of the study of Roman law and the rise of the Bologna school, were formerly erroneously attributed to the alleged discovery of a manuscript of the Pandects at the sack of Amalfi by the Pisans in 1137; but it has recently transpired that the study of the Roman law had begun to be pursued with ardor at Bologna and elsewhere in Italy long before that time. However, the manuscript in question, now called the *Pandectæ Florentinæ*, taken to Florence on the conquest of Pisa in 1406, is well known; it is a very ancient and valuable copy of the entire Pandects, being also the only one in existence that dates before the age of the Glossators. The fame of the school at Bologna spread throughout Europe, attracting crowds of students from all quarters and reviving a vivid interest in the Civil Law.

About 1135, or a little earlier, the code of Justinian was translated into French, and by the 13th century many French translations had been made of the Digest, the Institutes, and the Code. By the 12th century ecclesiastical councils had begun to forbid ecclesiastics to study the secular law (Rheims, 1131; the Lateran, 1139; Tours, 1162). This ecclesiastical inhibition served somewhat to check the study of the Civil Law at Paris—then as now the chief university town of Europe—and was favorable to the continued predominance of Bologna as the seat and centre of civil law study, to the growth of the Montpellier School, and to the establishment of new schools, the chief of which were at Toulouse and at Orleans. All these great schools in France—except Paris—and the numerous schools that sprung up in the succeeding centuries, taught the Civil Law on the basis of the Justinian text. After the spread of the scientific study of Justinian's works from Bologna to Montpellier and other parts of France, the Justinian law in the 12th and 13th centuries gradually replaced the ante-Justinian, as being the more perfect form of the Roman law. In 1250 France was still divided under two laws; in the south (*pays de droit écrit*) the Roman law obtained, modified by local customs; in the north (*pays de coutume*) local customs prevailed, slightly modified by Roman law, which, however, was taught in the northern schools and left numerous traces in the legal works of the period. A Dutch school of jurists arose toward the end of the 16th century at the University of Leyden. So, too, in Germany some progress was made in the study of the Justinian law. Like the jurists of other countries, those of Germany were impressed by the superiority of the Roman law to their native law, both in form and substance, and their

admiration induced them by degrees to put it forward in practice. The influence of the Bologna revival extended into Spain, where a crude codification was effected as early as 1263, called *Siete Partidas*, but not generally adopted throughout the kingdom until about the reign of Alonzo XI. in 1348. The Roman law worked its way into Scotland by way of France. From the close alliance that so long subsisted with France, Scotland, besides borrowing many of its institutions from that country, also "imported a large portion of Roman jurisprudence to make up the deficiencies of a municipal law, long crude and imperfect, and which had made little progress as a national system till some time after the establishment of the Court of Session in 1532 by James V., after the model of the Parliament of Paris. . . . Properly speaking, the teaching of the civil law commenced in Scotland at the Reformation in 1560"; after which date, as well as before it, the more ambitious students of the civil law also availed themselves of the best professional teaching of the continental universities. "In Scotland a knowledge of the Roman law has always been regarded as the best introduction to the study of the municipal law. . . . All the best writers on the law of Scotland, such as Stair, Bankton, Erskine, and Bell, were able civilians; and though they have not produced separate treatises on the subject, their works abound with admirable illustrations of the Roman law, evincing great learning and research, and a familiar acquaintance with the writings of the continental jurists." (Mackenzie, *Studies in Roman Law*, 40-1).

The influence of Roman law on the English common law has been very differently estimated by different writers. Mr. Stubbs stands at one pole of the controversy with his eyes shut, saying, "England has inherited no portion of the Roman legislation except in the form of scientific or professional axioms, introduced at a late period, and through the ecclesiastical or scholastic or international university studies. Her common law is, to a far greater extent than is commonly recognized, based on usages anterior to the influx of frudality,—that is on strictly primitive custom." (Stubbs *Const. Hist. of England*, I., 10 § 8.) This is perfectly insular and manifestly untrue. The other and sounder view as here taken is presented in Reeves' 'History of the English Law,' following Guizot and Mackintosh, and more recently an equally enlightened view has been taken by Pollock & Maitland in their 'History of English Law.' The definite traces of Roman law surviving the Roman domination of the island are exceedingly slight. Selden states that the Roman law wholly disappeared in England until it was re-introduced from Bologna in the 12th century. A little before the middle of the 12th century, Vacarius, a Lombard, went over to England with Archbishop Theobald and lectured on the Civil Law at Oxford with success. Even Stubbs admits that before the end of the reign of Henry II. the procedure of the Roman civil law had become well known by the English Canonists. Henry of Bracton was the first really scientific commentator on the law of England, and the greater and more important part of his work is little more than a transcript of the Roman law. He shows everywhere close familiarity with the *Corpus*

CIVIL LAW

Juris. The Novels are not quoted, but the Institutes are referred to, and there are many quotations from the Digest and the Code, while a very large number of passages are incorporated bodily into the text itself and into the tissue of the author's commentary without any statement as to their source. From Bracton and Glanvill to Pollock & Maitland, the predominating influence of the Roman law in English jurisprudence is everywhere traceable and evident. "The English system of equity and the ecclesiastical law have been formed more or less extensively on the Roman law or on the Roman through the Canon law." (Mackenzie, 'Studies in Roman Law,' 40.)

Both in England and in Germany the influence of the Roman law was resisted and its predominance looked upon with disfavor, but it nevertheless made its way *pari passu* with advancing civilization in each country, becoming in fact and effect the substantial *corpus juris* of the one country directly and of the other indirectly. Many causes combined to open the way both in Germany and in England for the practical application of Roman law. Among them, especially in England, were the impulse given by the universities and the Oxford School of Civil Law, the recognition of the Roman law in the clerical courts, whose jurisdiction extended over a class of civil matters, and the personal influence of the higher judges, who mostly belonged to the clergy, and were therefore versed in the Roman law. Above all, however, was the necessity of supplying the defects of the common law, which had become manifest from the growth of trade, the increase of intercourse, and the greater importance of movable property; for the common law had expended its best energies in the completion of the legal constitution of the feudal system, and had showed no tendency toward creating an original commercial law. To these causes must also be added the scientific superiority of the foreign law with its completeness, over the domestic law with its want of theoretical development. Even at an earlier period it is not improbable that the Roman law had been used as an assistant and complementary authority in the Curia Regis, upon which court it was incumbent to instruct the inferior judges in regard to the law in doubtful and omitted cases. A legal principle enunciated by that court had authority beyond the particular case in which it was laid down, and became, by means of its actual use, part of the *jus non scriptum, consuetudinarium*. As Roman legal matter obtained reception, although the written sources of the Roman law were not at all received as having a legislative authority, Bracton properly included the former among the *leges et consuetudines Angliæ*. (Prof. Dr. Güterbock, *Henricus de Bracton*, etc., translated by Brinton Coxe, 60-2).

7. *Code Napoleon*.—Some steps were taken during the reign of Louis XIV. looking to a codification of the French law. Little, however, was accomplished, and the French people owe to the constructive genius of Napoleon the present scheme of codification, which was undertaken during the consulate at his dictation, and finally completed, one code at a time, shortly after the end of his reign. The Civil Code, which was the first, was enacted and became the law of the land 21 March 1804. It was prepared by a council of jurists assigned by the First

Consul to the work; but he himself took great personal interest in it, attending many of the sessions of the Commission and contributing much by his acute suggestions to the form and content of the law. With some fitness he is reported to have said, "I shall go down to posterity with the Code in my hand." This code, called at first the Code Napoleon, but now the Code Civil, has to do with the law of obligations, of persons, of personal status, and of property. It contains 2,281 sections, many of them of only a line or two in length, and is comprised in a volume of less than 350 pages. The whole body of law in France at present, substantive and adjective, civil and criminal, is comprised in eight codes, as follows: *Le Code Civil; Le Code de Procédure Civile; Le Code de Commerce, Le Code Pénal; Le Code d'Instruction Criminelle; Le Code Forestier; Les Codes de Justice Militaire*. The scope and purpose of each of these codes is generally and sufficiently disclosed by its title. This codification is supplemented by the *Lois Usuelles*. The sources of the codified law of France are: (a) the ancient laws of the realm theretofore in force, consisting of local customs (custom of Normandy, custom of Paris, custom of Brittany, etc.); (b) the written or Roman law; (c) such legislative enactments of the National Assembly, the Legislative Assembly, and the Convention, and such of the Decrees of the Consuls and of the Directory, between 17 June 1789 and 15 March 1803, as were thought by the codifiers to be of permanent value; and (d) such general laws as have been enacted since 21 March 1804. The Roman law constitutes the foundation and groundwork of the structure, the other constituent elements indicated being merely subordinate or ancillary.

8. *The Extent of the Civil Law Throughout the World*.—The civil law in its modernized form and substantially as enacted in the Code Napoleon has, within a century past, become the law of more than three quarters of civilized mankind. To be more exact, it is thus the law not only of France and of all her colonies, but also of Italy, Greece, Switzerland, and all the minor countries of southeastern Europe, of Spain and Portugal, Belgium, Holland, and her colonies, of Austria-Hungary, Germany, Norway and Sweden, Denmark, Russia, Mexico, together with all the countries of Central and South America—all of the Western Hemisphere from the Texas border to Cape Horn—of Scotland and the Philippine Islands, the West Indies, and Louisiana, of Egypt, of all the other civilized parts of Africa, and of a majority of the more important British colonies, to-wit: Quebec, Ceylon, British Guinea and other English possessions in Africa, and Australasia. It is also working its way into Turkey and her dependencies. The German empire in 1900 adopted for the empire the Prussian Code, which is a Germanized version of the Code Napoleon; and Japan, as part and parcel of her scheme of civilization, has within recent years enacted a code of law on French lines, following closely even its minor details, thus writing the law of Rome—the Codes of Justinian and of Napoleon—into the jurisprudence of the remote islands of the sea.

9. *Resemblance Between the Civil Law and American Law*.—Aside from matters of procedure and minor detail, the actual differences be-

CIVIL LAW

tween the living Civil Law as it exists throughout the world and the English common law, as refined and modified in this country and now administered here, are not great, certainly not greater than we should reasonably expect, having regard to the controlling influence,—conscious and unconscious—of the Civil Law, upon the growth and development of the common law in England, and having in mind the fact that many English judges, notably Mansfield and Holt, and several of the chancellors for the past 200 years at least, have professedly drawn copiously from the great reservoir of Roman jurisprudence, whenever occasions have arisen for modifying or extending common law principles or for applying them to new conditions of fact and circumstance. The so-called Common Law of England, certainly from the 11th century, is, in reality, largely the Custom of Normandy and the Custom of Paris, as imported at the Conquest in 1066 A.D. Its scientific terminology and its exact legal language even in its present form are essentially French. Chief Justice Holt nearly 200 years ago said: "Inasmuch as the laws of all nations are doubtless raised out of the ruins of the civil law, as all governments are sprung out of the Roman empire, it must be owned that the principles of our law are borrowed from the civil law, and, therefore, grounded upon the same reason in many things." (12 Mod. Rep. 482.) Sir William Jones, writing during the Revolutionary War, said: "With all of its imperfections, the Digest is a most valuable mine of judicial knowledge; it gives law at this hour to the greatest part of Europe, and though few English lawyers dare make such an acknowledgment, it is the source of nearly all our English laws that are not of feudal origin." And Mr. Hornblower, addressing the New York State Bar Association (1902), has just said: "It is also well for us votaries of the common law to remember that there is another jurisprudence founded upon the Roman or the Civil Law, and prevailing throughout the greater part of continental Europe, from which we have ourselves borrowed many of the most important legal principles." If we eliminate from the law of England as it obtains in this country, our technical rules of evidence, which have grown up about our system of trial by jury, our pleading and the peculiarities connected with the tenure, transmission, and devolution of real estate (which are each of them, for the most part, little more than an antiquated mass of ignorance and rubbish, of which it is the modern tendency of our American jurisprudence to relieve us), the rest of our system is not very different, at least in its elements, from modern Civil Law. The following subjects in American law may be mentioned, which have been largely influenced by the Civil Law, and resemble that system in many important elementary principles, namely, the subject of probate, of succession to personal property and testamentary capacity; the law of admiralty; the law merchant, largely of continental origin; the law of equity and trusts; the law of corporations as juridical persons distinct from the incorporators; the law of *res judicata*, fully expounded in the Digest of Justinian; the theory and practice of *habeas corpus*, the leading principles of which are found in the same compilation; the law of alluvion, of accession, and of

wild animals; and finally the great subject of obligations in general as arising from contract, *quasi* contract, tort, neglect, and the operation of law, the logical arrangement of which by the civilians becomes more and more useful in legal analysis and discussion. To these we may add the general doctrines of public and private international law which are mainly of continental origin. (Howe, Roman and Civil Law in America, 16 Harv. Law Rev. 342.)

10. *The Importance of the Civil Law in America.*—The present practical importance of the Civil Law to us consists in the fact that about one sixth part of the present population of the United States and its dependencies—or, to put it in figures, more than 12,000,000 of our population—live under the civil law, and are governed in their personal and property rights by some form of it. Thus Louisiana, with a population of 1,400,000, Porto Rico, with a population of 1,000,000, the Hawaiian Islands, with a population of 150,000, the Philippine Islands, with a population of 8,000,000, and Cuba (if indeed it may be included), with a population of 1,600,000, are governed by the civil law. Not only, therefore, must our judges and lawyers acquire familiarity with it and facility in working in it, but our commercial and trading classes are finding it constantly of more and more consequence to them in their business. Not only is much of our law derived from it, but many millions of our people live and must continue to live under it. It is a curious fact that the Custom of Paris was in force in Michigan and Wisconsin down to the year 1810, when it was formally abolished, in Michigan at least, by the legislature of that State. (18 Wis. 158; 8 Mich. 25.) All the French colonies established in the 17th and early part of the 18th century in North America were governed by the Custom of Paris, which still remains in Quebec the basis of the codified law of that province. By a royal ordinance the laws, edicts, and ordinances of France and the Custom of Paris were extended to Louisiana, and that system of law thus introduced prevailed there until 1763, when France ceded the country to Spain. That introduced the Spanish law into Louisiana, which was, however, only another form of the Civil Law. In 1808 a Civil Code was adopted by the Territory of Orleans based to a considerable extent on the Code Napoleon, and, as revised in 1825 and subsequently, constitutes the present Louisiana Code. We probably owe to the study of Blackstone's Commentaries much of the unreasoning prejudice which has hitherto existed to some extent in this country against the study of the Civil Law. Blackstone began to be read by law students in America about 140 years ago, and from then to now has been for the most part the initial text-book for all lawyers and law schools. He writes bitterly in his first lecture about the civil law. But it is manifest that he wrote without knowledge and under the influence of a set of political prejudices, and with a bias and prepossession with which we in the United States may well have little sympathy. Abstractly, there is no more reason why Americans should entertain a prejudice against the Civil Law than against the law of gravitation, and there are cogent reasons, practical as well as scientific, why we should—now at least when it has become a matter of real personal

CIVIL LIST — CIVIL RIGHTS BILLS

concern to so considerable a part of our people — give serious attention to modern Civil Law.

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Civil List, a term signifying in the United States, (1) a list of the entire expenses of the civil government, (2) the revenue appropriated to support the civil government, (3) the officers of the civil government who are paid from the public treasury.

In England the meaning of the term formerly represented the whole expenses of the government with the exception of those of the army, navy, and other military departments. It is now limited to the expenses proper to the maintenance of the household of the sovereign. It was once a principle in England, as in other Teutonic nations, that the monarch was to pay all the expenses of government, even including those of the army, from the possessions of the crown, the domains, and that the subjects were not obliged to contribute anything more than they voluntarily engaged to. From this principle, which is proved by the history of the origin of the domains, it appears that the crown lands in general cannot be considered the private property of the ruling family. On the contrary, they are, in general, the property of the state, and have been given to the prince to defray the expenses of government. Until the Restoration the whole expenses of the government continued to be defrayed out of the royal revenue. The first Parliament of Charles II. fixed on £1,200,000 (\$6,000,000) as the ordinary revenue of the crown in time of peace. For this they provided by taxation, which ultimately produced more than the amount of the grant. The same taxes were continued during the reign of James, and produced on average £1,500,000 (\$7,500,000), besides which he received extraordinary grants. At the commencement of the reign of William, the Commons made still further restriction on the royal control of the revenue. They voted £1,200,000 (\$6,000,000), as the revenue of the crown in time of peace, one half of which was appropriated to the maintenance of the king's government and the royal family, the other to public and contingent expenditure. The outbreak of war prevented this arrangement from being exactly carried out, but the Commons maintained

the principle of separating the regular and domestic expenses of the king from the public expenditure, and establishing a systematic and periodical control over the latter. The amount actually voted to the king for life in 1697 was £700,000 (\$3,500,000) and the same vote was made at the commencement of the reign of Queen Anne and George I. On the accession of George II. £830,000 (\$4,150,000) was voted. Besides the regular vote, grants had been frequently made to defray debts incurred in the expenditure of the sovereign. On the accession of George III. the civil list was fixed at £800,000 (\$4,000,000), but instead of being paid out of appropriated revenues in which the crown lands were included, these were surrendered, and it was charged on the ordinary taxation. Large extra grants had to be made during this reign. At the commencement of the reign of Victoria a civil list of £385,000 (\$1,925,000) per annum was settled on her majesty for life for the support of the royal household, and the maintenance of the dignity of the crown, £60,000 (\$300,000) being allotted to the privy purse. In 1901 the civil list of King Edward VII. was raised to £470,000, (\$2,350,000); £110,000 of this being for the privy purse. Many continental states have a fixed civil list; that of Russia is equivalent to \$7,050,000; of Turkey, \$4,600,000; of Austria, \$3,650,000; of Prussia, \$4,500,000.

Civil Procedure. See COURT.

Civil Rights Bills. 1. An act to carry out the intention of the Thirteenth Amendment, prohibiting slavery — which it was alleged the Southern States were attempting to nullify by public and private action — and secure the political equality of the ex-slaves with the whites. It provided that all persons born in the United States and not subject to any foreign power, excluding Indians not taxed, were citizens of the United States, and entitled to the same immunities, irrespective of race or color, or previous condition of servitude, except as punishment for crime; punished as a misdemeanor any deprivation of such right under color of State law; transferred cognizance of such cases from the State to the Federal courts; intrusted the execution of the act to national officers only, and fined them for refusal; punished resistance to the officers; provided for fees; empowered the President to send officers to any district where the act was likely to be violated, and to call out the national forces to execute it; but permitted an appeal to the supreme court. Significantly, it employed somewhat the same means to emancipate the negro which the Fugitive Slave Law did to re-enslave him, especially in over-riding or supplanting State officers; and for the same reason — they could not be trusted in the sections where it was to be enforced. The bill was passed in the Senate 2 Feb. 1866, 33 to 12; in the House 13 March 111 to 38. Andrew Johnson vetoed it 27 March, and it was passed by the requisite two thirds over his veto, in the Senate 6 April and in the House 9 April. Even so, the debate had brought out two grave doubts of its constitutionality; that the protection of civil rights under the Constitution belonged not to Congress but to the States, and that under the Dred Scott decision (which stood as a precedent for the supreme court until reversed), negroes could not become citizens even by emancipation. This led to the proposal of the Fourteenth

CIVIL RIGHTS CASES — CIVIL SERVICE

Amendment (see CONSTITUTION, *Amendments*), which passed both Houses in June.

2. An act extending the foregoing to the exclusion of negroes from juries, and from equal privileges in schools, public conveyances, hotels, theatres, etc. This had been persistently urged by Charles Sumner, for some years before his death; was offered as an amendment to the Amnesty Bill of 1872, and lost by only one vote; again introduced into the House in December, and referred to a committee; on 30 April 1874, a few weeks after Sumner's death, it passed the Senate, but the House rejected it; it finally passed both Houses in February 1875 and was signed 1 March. For an account of its partial invalidation, see next article.

Civil Rights Cases. These were five test cases in the United States supreme court of the constitutionality of sections 1 and 2 of the second Civil Rights Bill, described above; decided in one group, October term, 1893, and reported and cited under the title above. All came up from circuit courts; three on certificates of division of opinion, two on appeal for error; and while the decision on the act was adverse to all, and the first three were found for defendant, the error was admitted and the decision given for plaintiff in the last two. Two of them were for hotel discrimination, two for theatre discrimination, one for railroad discrimination; the first four submitted 7 Nov. 1882, the last one 29 March 1883. The cases were: *U. S. v. Murray Stanley*, from the Kansas district: hotel case. *U. S. v. Michael Ryan*, California district; refusing a negro a seat in the dress circle of Maguire's Theatre, San Francisco. *U. S. v. Samuel Nichols*, Western Missouri district: hotel case. *U. S. v. Samuel D. Singleton*, southern New York district; refusing a negro a seat in the Grand Opera House, New York. *Richard A. Robinson, and Sallie A. Robinson his wife, against the Memphis & Charleston R.R. Co.*: refusal to allow the wife a seat in the ladies' car from Grand Junction, Tenn., to Lynchburg, Va. The decision of the court was given by Justice Bradley, Harlan dissenting. The terms of the first section of the act are that "All persons within the jurisdiction of the United States shall be entitled to the full and equal enjoyment of the accommodations, etc., of inns, public conveyances by land or water, theatres, and other places of public amusement," and that laws must be "applicable alike to citizens of every race and color, regardless of previous condition of servitude." The second section affixes penalties. The court held that these two sections are unconstitutional as applied to the States, not being founded on either the Thirteenth or Fourteenth Amendment (see CONSTITUTION, *Amendments*): the former merely prohibits slavery, which is not constituted by a denial of civil equality; the latter is prohibitory merely on the States, not on individuals, and it was not alleged that the discrimination was made under State laws. Congressional legislation for enforcing the latter amendment is not direct legislation, but corrective, counteracting or redressing State legislation of a sort forbidden by the amendment. For private injury from discriminations, the remedy must be sought in State laws — to withdraw it from which was the precise object of the act.

Civil Service, that branch of the public service which includes all executive offices not connected with the army or navy. The term is not applied to the direct representatives of the people, as the President of the United States or the governor of a State. Owing to the complexity of modern government and the variety of its functions, the civil service has become very complex, and the problem of its effective administration a difficult one.

In Great Britain the service comprises various departments, such as the home office, the foreign office, the war office, admiralty, post-office, customs, excise, etc. Formerly, appointments to the civil service in Great Britain were the gift of the executive government, and were obtained by influence, while the bestowal of them was used as a means of gaining parliamentary support on behalf of the government. Those appointed were not generally called upon to show whether they were competent or not. In 1855 examinations were instituted to test the efficiency of all candidates for subordinate posts; but for some time candidates were specially nominated for those posts. As more than one might be nominated for a post, competition was gradually introduced, and in 1870, it was directed that appointments in the civil service should (with certain exceptions) be filled by open competition, as was already the case with appointments in the Indian civil service. The appointments to what are known as clerkships in the civil service are divided into two classes or divisions, with different age limits and salaries. In the higher division, while the examinations are more severe, the salaries are much better; the two divisions are kept quite distinct; and it is rare for a person to be promoted from the lower to the higher. For a number of appointments open to competition special qualifications, scientific or technical, are necessary, while there is also a special limit of age. A large number of subordinate appointments in the postal and telegraph service, the excise, etc., are on a different footing from the clerkships just mentioned, and are not so well paid. All persons who have served in an established capacity in the permanent civil service are given a pension, varying with the length of service, at the time of retirement. The total expenditure of the civil service of Great Britain is about \$90,000,000.

In the United States the Federal civil service numbers over 100,000 officials in the various administrative departments. The Constitution provides that the President, "with the advice and consent of the Senate," shall appoint all officers of the United States whose appointments are not otherwise provided for by the Constitution. This gives the chief executive power to choose the heads of departments, as well as their subordinates. In the separate States the appointive power of the chief executive is much more limited. The heads of the State departments such as the attorney-general and comptroller, etc., are elected by the people, and usually have the constitutional right to select most of their own subordinates. The governor therefore appoints only his own secretaries, etc., members of commissions, heads of bureaus, and the like. With the development of party government in the United States, the patronage placed in the hands of elected officers through their power of appointment, has led to

CIVIL SERVICE REFORM

the giving of offices as a reward for party service (the spoils system), and to considerable inefficiency and unnecessary expense in public administration. A reform is being brought about by the appointment of officials according to merit in public examinations. See CIVIL SERVICE REFORM.

Civil Service Reform, the improvement of the civil service in methods of appointment, rules of conduct, etc.; in the United States, the movement for the appointment of public servants according to their fitness for their work, rather than their services to the party in power.

In the year 1835 a debate took place in the Senate of the United States on the condition of the civil service, and especially on the abuse of the power of appointment and removal to serve party ends instead of public ends. Among the senators who took part in the debate were the three whom history has judged the strongest in that famous body, Daniel Webster of Massachusetts, Henry Clay of Kentucky, and John C. Calhoun, of South Carolina. Differing widely in their views of party policy and rivals in ambition, they were of one mind as to the true nature of the public service, and as to the errors and evils that had crept into it. Mr. Webster, then in the prime of his young manhood, had already won the title of the "Great Expounder of the Constitution." He thus stated the idea in which the others heartily joined: "The theory of our institutions is plain; it is that government is an agency created for the good of the people, and that every person in office is the agent and servant of the people. Offices are created, not for the benefit of those who are to fill them, but for the public convenience."

There is no doubt that this is indeed the true theory of our institutions. It is to be found in all the early writings of the men who formed the government. It is the basis of the Declaration of Independence, that "governments are instituted among men" to secure the rights of "the governed" from whose consent "they derive their just powers." When our national government was founded it was the only one in which offices were not a privilege, but a trust, imposed by the choice of the people and for their sole interest. Neither birth nor rank, nor wealth gave any title to them. Each of the men who held them was intended to be, in the words of Webster, "the agent and the servant of the people."

This theory had grown out of the needs of the American people, and fitted them closely. As colonists they had had to work and fight hard for the right to live and the means to live as free men in a wild land, far from the homes of their fathers, amid many perils and hardships. There was no ruling class among them. To attend to the common business of each little settlement, they were led to choose among their own number the agents best fitted for the task. These in the early days were, as in the towns of New England they still are, "select-men," "trustees." The name shows what was expected of them, and what was their title to employment. As the towns were grouped in counties and the counties in States, the public business grew, became more complex, and required a larger number of agents with different duties and powers, but the idea held. They were still agents, selected men, trustees. From the most modest

unpaid village or town officer to the President of the United States, the Commander-in-Chief of the army and navy of the nation and its representative in the eyes of the world, no man in the public service in this country is anything but the agent, the trustee of the people.

One result of the growth of the public business has been that only a small part of the agents for doing this business are chosen directly by the people. Those thus chosen are entrusted with the employment or appointment of a very large number of others. The chief difference between the two classes is that those elected are expected to carry on the public business in a way that the majority of the voters are in general agreed upon. They are the choice of the majority party and, so far as the rights of all permit, they are the agents of that party. When the views and wishes of the majority change, these agents are usually changed also. But the far greater number of agents for doing the public business are appointed or employed. The duties of nearly all these are the same no matter what may be the policy of the majority party. In the national government, for instance, the main work for those in office, except the highest, is the collection and expenditure of the taxes. The taxes are collected on goods brought into this country for sale or on goods made here for sale; in other words, customs, duties, and internal revenue taxes. Parties differ widely as to which class of taxes should be the higher, and as to how high the custom duties should be. But all parties agree that the taxes of all sorts should be collected according to law, honestly and fairly, that the money should be carefully accounted for, and none of it stolen or wasted. Agents for this purpose need to be good business men of character and ability; they do not need to be of one party or another. Again, the Post-office Department does a great part of the business of the government. It collects mail matter of all kinds, transports it, delivers it at home or abroad, makes large payments on money orders, and sells the stamps by which the cost of its work is paid. As to this work, there is no difference at all between parties, and there has never been. The agents engaged in it need only to be honest and efficient. They do not need to be of one party or another. In all offices where the duties are of this sort, it is plain that those engaged in them should be selected for merit only, promoted as the service requires, and removed only for failure or incapacity to do their work in the best manner.

Such a policy would answer to Webster's statement of the theory of our institutions, and to the practice of the early Presidents. Washington declared: "In every nomination to office I have endeavored, so far as my own knowledge extended or information could be obtained, to make fitness of character my primary object." In the first 39 years of the history of the government the six Presidents made only 112 removals. A few years later, when Webster had to define anew the true theory of the public service, a very different practice had grown up. It was frankly described in that same debate by Mr. Marcy, a senator from New York. He said: "The politicians of the United States are not so fastidious as some gentlemen are as to disclosing the principles on which they act. They see nothing wrong in the rule that to the victor belongs

CIVIL SERVICE REFORM

the spoils of the enemy." This theory is plainly the opposite of the true one. Under it elections do not merely settle the policy of the country, as to which parties may unselfishly differ. They become contests for spoils as well, and tend to become more and more contests for spoils and less disputes as to principle. The spoils are the offices, the places of trust, and these tend to be given not to those best fitted to perform their duties, but to those who have claims on the party. The service is hurt by putting out tried men and putting in untried men, and since the untried men are chosen for other reasons than fitness, they are apt to be poorer officers. Since they owe their employment to party favor, and do not get it on their merits, they are likely to be less faithful and less honest. They are liable to be turned out at the next election, and they are tempted to make all they can from their places. The offices tend to be regarded as created not "for the public convenience" but "for the benefit of those who fill them." The service tends to become poorer, less honest, more costly. Any large private business conducted in this way would surely come to disaster. So would the business of the government if it had not the pockets of the taxpayers to draw on.

The Spoils System.—The spoils system prevailed in the service of the United States government for about a half-century after 1830. It also prevailed in greater or less degree in the service of the several States and of the larger cities. It was not confined to any one party. All were more or less corrupted by it. The effect on the politics of the country was very bad. The pressure for public employment, always strong, became extreme. Probably the election of 1860 was as largely decided by moral conviction as any in the history of the country. Yet, one month after he took office, President Lincoln groaned under the burden of this pressure. "I wish," he wrote, in his simple phrase, "I could get time to attend to the Southern question. I think I know what is wanted, and believe I could do something toward quieting the rising discontent, but the office-seekers demand all my time. I am like a man so busy letting rooms in one end of his house that he cannot stop to put out the fire that is burning in the other." In the crisis of the war for the Union he was visited by a committee of New York politicians, intent on patronage. The chairman opened his address with a reference to the "awful burden of the nation's fate weighing on the president." "Gentlemen," interrupted Mr. Lincoln, "it is not the fate of the nation that worries me most just now; it is your pesky post-office." These incidents throw a strong light on the waste of time, of money and of strength imposed by the spoils system. The degradation and pollution of politics were even worse effects. The office-holders, living on the spoils of the place, and greedy for more, seized the organization of their party, whichever it happened to be, and made the free exercise of honest preference among the voters difficult and often impossible. The scramble between factions in the party in possession became as intense as between opposing parties. In the Custom House in New York, five collectors of the same party made 1,878 removals in a period of 1,565 business days, and the service grew steadily worse. In 1881, Guiteau, an office-seeker from

New York, where a bitter factional fight had long been raging, half-crazed with disappointed greed, assassinated President Garfield, to whom he charged his failure.

The Merit System.—This proved the turning point. At the next session of Congress bills were introduced for the establishment of the merit system, and a law was passed in January 1883. It was entitled "An Act to Regulate and Improve the Civil Service of the United States." The object of the law was to secure appointment and promotion in the service for fitness. For this purpose appointments were to be made from those graded highest as the results of open competitive examinations, the appointments being made final only after a period of probation or trial. This system was to be extended throughout the service as fast and as far as the President should direct. When any part of the service was to be brought under the system, it was to be arranged in classes by order of the President; hence the term "classified service" means, under the law, the part of the service in which the merit system is applied. Within the classified service, the examinations for appointment and for promotion are chiefly competitive; that is to say a list, called an "eligible list," is made of all applicants passing a fixed grade, in the order of their standing, and a selection is made by the appointing officer from the three highest on this list. This selection is for the period of probation or trial, six months, at the end of which term, if his conduct and capacity are satisfactory, the probationer is absolutely appointed; if not, he is discharged. Non-competitive examinations are held according to the rules laid down by the President. In these all applicants passing a fixed grade are eligible to appointment without regard to their relative standing. The rule as to probation is the same as in the other cases. The law requires that all "examinations shall be practical in their character, and as far as may be shall relate to those matters which will fairly test the relative capacity and fitness of the persons examined to discharge the duties of the service into which they seek to be appointed." Close attention is paid to this requirement. In the first place, weight is given to the experience of the candidates in the kind of work they seek, when such experience can definitely be known. Then each class is tested as to the knowledge and skill particularly needed. For clerks and accountants, weight is given to accuracy and quickness in figures, to clearness and rapidity in writing, and to familiarity with the principles and methods of book-keeping. Examinations are generally for entrance to the lower grades of the service, and actual excellence in the performance of work counts in promotion. For places requiring special knowledge, trained examiners are employed. For instance, the examiners who set the questions and rated the answers in the case of the supervising architect were prominent architects from various parts of the country. They were able, from the records of the candidates, to test not only professional knowledge, but business capacity. In all cases the examiners are selected from those who are well informed as to the work to be done. The application of this law is to be carried out and watched by a commission, known as the United States Civil Service Commission, made up of three members,

CIVIL SERVICE REFORM

appointed by the President with the advice and consent of the Senate. This commission aids the President in the formation of the rules under the law, and, with the aid of examiners, sets and conducts the examinations. All appointing officers are required to report to it all changes in the classified service, of which the commission keeps a full record, as well as of its own examinations and other proceedings. All officers of the service are required to aid in the performance of the duties of the commission.

One of the worst evils of the spoils system was the fact that public employees were made to pay a large fraction of their salaries to party funds, and another was that these employees were forced to work for the party in power in order to keep their places. Both these practices are now forbidden by law in the service of the United States. No one in the service is allowed to use his official authority or influence to coerce the political action of others. All persons in the service are forbidden to ask or receive political contributions from others in the service. Such contributions cannot be solicited in any place or building used by the government. By the rules, which have the force of law, no question can be asked of candidates for appointment as to their political or religious opinions; no disclosures of such opinions can be considered; no change of rank or pay can be made because of such opinions. Under the spoils system, the office-holder got his place from his party and was taxed heavily by his party managers. The law intends to put a stop to that; it holds the officer bound only to earn his pay by honest work, and free to spend it as he chooses. The law further holds him without fear of harm or hope of aid from outside, to do his duty to his employers, the whole people of the United States. It aims to put the people and those who work for them on the same footing that is maintained in honorable private business between employers and employed.

The merit system has been greatly extended since the passage of the law. Under President Arthur, who signed the law in 1883, some 16,000 places were brought within its provisions. The number is now over 80,000. This is nearly a half of all the places in the executive service, while the salaries paid in these places are nearly three fourths of all paid in the service. While this advance has been made there have been more frequent changes of party in the government of the country than in any like period in our history. In the five elections since 1883, four have resulted in a change of party. Each succeeding President until the present has, in the discretion which the law confides to the President only, added to the number of places removed from the spoils system. President McKinley withdrew a considerable number of places from the merit system for reasons urged upon him by the heads of some departments. The effect has been unfortunate. On the other hand, the merit system has been extended to the service in the Philippine Islands in a way that promises to make the work of governing there clean, efficient, and fair to a degree that could hardly have been looked for. In this region the bond of trusteeship rests upon our government with a peculiar and solemn obligation. The United States have taken control of the affairs of the people of these islands as the result of a war with Spain, without the assent of the peo-

ple in the first instance, and against resistance by a portion of them which was overcome by arms. It would be a sore disgrace, if their affairs were not managed honestly and purely and for the interest of the governed. The merit system on the lines of the Civil Service Law has been established there, under the general guidance of an experienced and skilled examiner from Washington. As many natives as practicable are being employed. It is still too early to judge of the final outcome, but the beginning is promising.

The chief aim of the merit system is, on the one hand, to get the best service for the government—that is, for the people—and, on the other hand, to remove from the party contests of the country the corrupting influence of the vast number of business places offered as spoils to the victors. The methods of competition and probation are not perfect, and, like all other human methods, are liable to mismanagement. But they are the best that have ever been tried, and they are very effective. The test of competitive examination is shown to be thorough and practical by the fact that only a very small number of those who pass that test are dropped after probation or trial. Another proof is the much larger amount of work done by persons so selected. During 10 years before the adoption of the merit system in the departments at Washington the number of clerks increased from 3,300 to 5,523, or more than two thirds. In the 13 years after the system was adopted the number actually fell off 211, or three per cent, while the work of the departments had largely increased. Another proof of the efficiency of the system is the small number of changes that take place in it compared with those that take place in the branches of the service where the system is not yet applied.

Two facts are noteworthy with regard to the effect of the use of the merit system on partisan contests in politics. The total cost of the executive service is over \$100,000,000. Of this nearly \$75,000,000, or three fourths, is now paid to those employees who are under the merit system. This very large sum is no longer held out as prizes for partisan activity, or treated as the "spoils of the enemy." The other fact is that the feeling of the people that the government is theirs, and does not belong to the party in power for the time being, is greatly strengthened. The entrance examinations are held in all parts of the land, and men and women are selected for the departments at Washington with no regard whatever for their party views or the influence of politicians. This has been of great effect in laying to rest the passions bred by the Civil War, and giving to the dwellers in the South a sense of their common rights and duties as citizens of the nation. It is a great and lasting gain.

In 1884, laws for the introduction of the merit system were enacted in New York and Massachusetts, and later laws authorize the system in the service of cities in Wisconsin and Illinois. In Massachusetts and in New York the system has made much progress and the results have been good in proportion as the system has been extended and honestly and faithfully applied. But the evils of the spoils system still prevail almost without check in the service of the cities and the States throughout the country. The enormous number of

CIVIL WAR IN AMERICA

places involved are still almost wholly the prizes of party contests. The place-holders, many times more numerous than the present army of the United States, are in greater part enlisted for party rather than for public service. Efficiency, industry, and economy in the public work are hard to secure. The suppression of vice and the decent administration of the affairs of cities and States are made more difficult.

Clearly it is best that the merit system should be applied to all that portion of the civil service in which the duties are of a business nature and in which the office-holders are not called on to fix the policy of the government. There is no Democratic or Republican or Populist way of being honest and industrious and intelligent which all Americans may not use. To these qualities in their service the people have a right, and no party can claim a monopoly of them. Much remains to be done to complete the work so well begun. The men in all parties who look on public employment, not as a trust, but as the spoils of party victory, resist all advance and seek to undo what has been done. They cannot succeed if the true nature of the merit system is understood, its honesty and fairness, its high utility, and its fidelity to the fundamental principle of the free institutions of the American republic.

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Civil War in America. The number of engagements entered in the government's 'Chronological List of Battles' exceeds 2,200. An alphabetical list of battles compiled at the bureau of pensions, including such minor actions and skirmishes as seemed worthy of incorporation, contains over 6,800 separate affairs. It is therefore clear that, even in a comprehensive narrative of the War, a large number of the lesser engagements must be ignored. Merely to state strength and losses for the battles mentioned would form a lengthy statistical article. For these figures the student is referred to the separate accounts in this work of the various battles herein treated.

The Civil War of 1861-5 was inaugurated by the determination of seven Southern States to withdraw from the Union. South Carolina led by passing an ordinance of secession 20 Dec. 1860, followed by Mississippi, 9 Jan. 1861; Florida, 10 January; Alabama, 11 January; Georgia, 19 January; Louisiana, 26 January; and Texas, 1 February. On 7 February the Choctaw Nation declared its adherence to the Confederacy.

During the autumn of 1860 and the early spring of 1861 the forts, arsenals, custom-houses, and other government property in those States, with few exceptions, had been seized by State troops, and large sums were voted for arming the States, Georgia leading in November 1861, by appropriating \$1,000,000. Major Robert Anderson, a Federal officer, who held Fort Moultrie on the inner line of Charleston harbor, becoming aware of active preparations for capturing that work, withdrew, on the night of 26 December to Fort Sumter in the centre of the harbor. This move hastened results. Immediate preparations were made for bombarding the fort. The first firing upon the flag was 9 January by the batteries erected against Fort Sumter, the inciting cause being the appearance of the *Star of the West* off the harbor. This vessel had

been sent from New York with provisions for Sumter, and with the accompanying fleet withdrawn without replying to the fire.

Delegates from the seceded States met at Montgomery, Ala., 4 February, and 8 February adopted a provisional government, "The Confederate States of America," and the next day elected Jefferson Davis of Mississippi President, and Alexander H. Stephens of Georgia Vice-President of the Confederacy.

On 1 March Gen. P. G. T. Beauregard, appointed by the Confederate government, was sent to Charleston and took charge of the preparations for reducing Fort Sumter. On 4 March Abraham Lincoln was inaugurated as President of the United States. On 10 April Beauregard was instructed to demand the surrender of the fort, and, in case of refusal, to reduce it. The next day Anderson received and promptly declined a demand to evacuate, and at daylight 12 April, the Confederate batteries opened upon Fort Sumter, compelling its surrender on the 14th. The expectation of a relieving fleet probably hastened this attack.

With the news of the attack and surrender the country received President Lincoln's proclamation calling for 75,000 volunteers, and summoning Congress to meet on 4 July. In an instant discussions over the power to coerce States, the discussions of peace conventions and movements, and all similar perplexing questions were brushed aside, and the North responded with intense enthusiasm, the predominating sentiment being the preservation of the Union. The South was equally aflame, rallying under the banner of State rights.

On 8 April President Davis had called for 20,000 volunteers, and the day following President Lincoln's proclamation he asked for 34,000. Two days later the Confederate Congress authorized the raising of 100,000 men. Three days after the surrender of Sumter Virginia seceded, followed 6 May by Arkansas and Tennessee, and 20 May by North Carolina, the belief being then general that a policy of coercion had been decided upon. The border States of Kentucky and Missouri were held to the Union by their loyal element, and Maryland was held at first by the direct power of the national government, and later by its own loyalty. The first two were represented in the Confederate Congress throughout the War. The movement to take Missouri into the Confederacy was thwarted by Gen. Nathaniel Lyon, who captured Camp Jackson near St. Louis 10 May, and on 17 June, having already taken the State capital, in a brief engagement dispersed a force which Governor Jackson had gathered at Booneville. This resulted in relieving the capital from those plotting secession. Kentucky at first declared for neutrality, but at the election for members of Congress, 20 June, it was made clear that the State was lost to the Confederacy. In May the Confederate capital was moved from Montgomery, Ala., to Richmond, Va., where troops from all parts of the Confederacy were rapidly assembling. In like manner, the Northern States were pouring troops into the national capital, and Washington soon became a vast military camp. The Union forces crossed into Virginia 24 May and encamped opposite Washington.

For a brief time Baltimore resisted the passage of troops to the capital. Four hundred Pennsylvanians reached Washington 18 April,

CIVIL WAR IN AMERICA

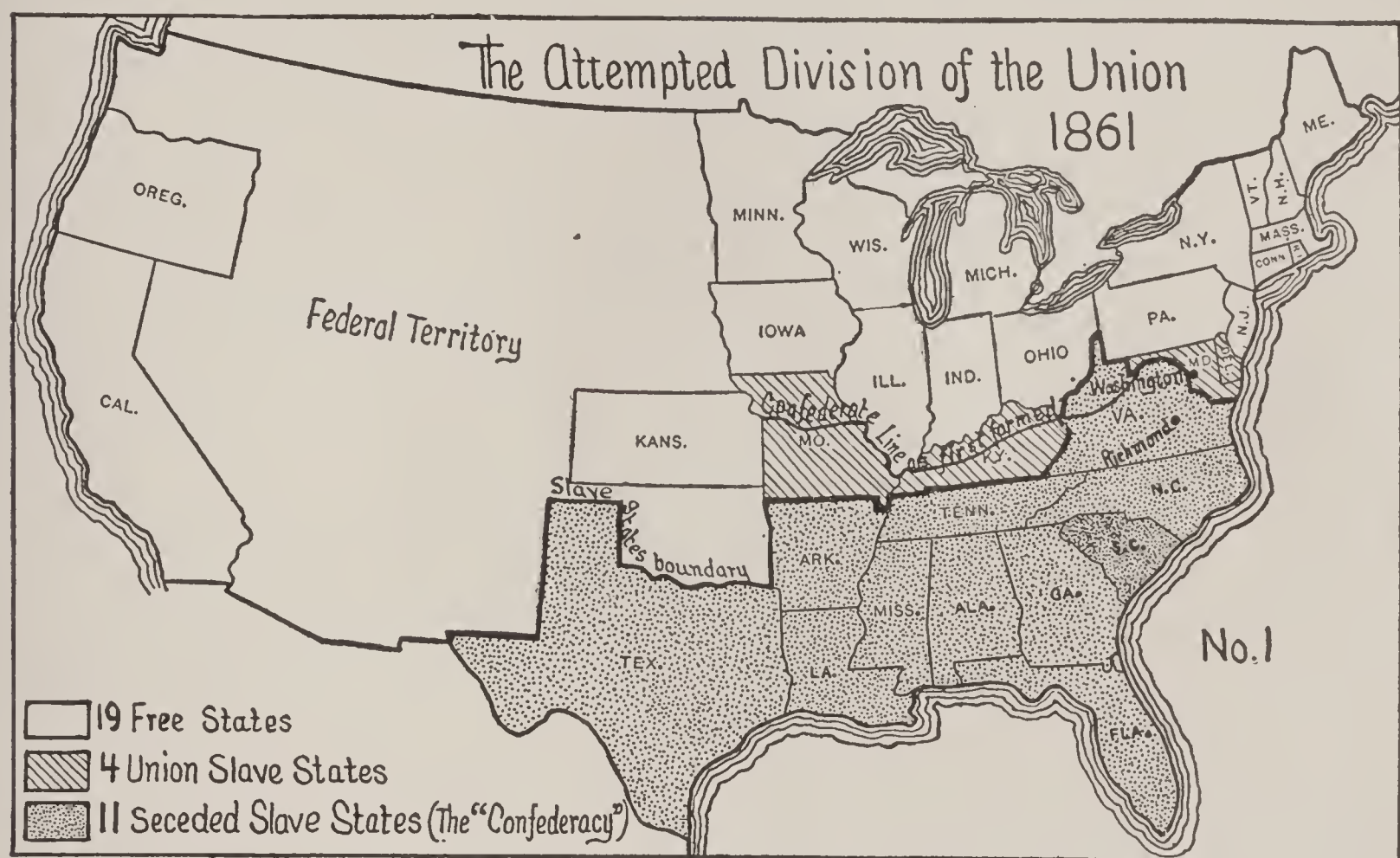
but the 6th Massachusetts regiment was attacked in Baltimore 19 April. The 7th New York reached Washington 25 April from Annapolis. Brig.-Gen. B. F. Butler, with the 8th Massachusetts, had reached Annapolis on the 20th, and on the 22d had proceeded to the Relay House. On the night of 13 May he occupied Baltimore, and thereafter the route to Washington was unobstructed. Harper's Ferry, with its arsenal and machinery for manufacturing small arms partially destroyed, was seized by the Confederates 19 April, and Gosport Navy-Yard, near Norfolk, 20 April, with guns, stores, ships, and machinery of immense value.

On 20 May Gen. Butler, having been made a major-general of United States volunteers, was assigned to the command of the Department of Virginia and North Carolina, with headquarters at Fort Monroe. On 10 June he moved against a force under Gen. J. B. Magruder at Big Bethel and was defeated. While it was comparatively a small affair, like another about

Congress met in special session 4 July. It legalized all President Lincoln's acts with respect to the army and navy, and authorized a further call for 500,000 men, a national loan of \$250,000,000, and an increase of the navy to render effective the blockade of the Southern ports which had been declared 19 April by President Lincoln.

Following the Philippi defeat, the Confederates sent Gen. Henry A. Wise to the Kanawha Valley, and Gen. Robert S. Garnett to Beverly. Gen. William S. Rosecrans, who was commissioned brigadier-general in the regular army 16 May, joined Gen. McClellan from Ohio, and 11 July defeated the Confederate forces under Col. Pegram at Rich Mountain. On 13 July Gen. Garnett, during the retreat of his column, was killed at Carrick's Ford. His command escaped, leaving Gen. McClellan in control of northwestern Virginia.

The latter part of July, upon hearing of the arrival of Gen. J. D. Cox of Ohio in the



the same time at Vienna in front of Washington, both caused widespread dissatisfaction and mortification at the North.

Under President Lincoln's call Ohio promptly organized 13 regiments, and 23 April Capt. George B. McClellan was appointed major-general of Ohio militia. On 14 May he was commissioned major-general in the regular army and assigned to the Department of the Ohio, embracing that State, Indiana, Illinois, and, later, West Virginia. In May the Confederate government had despatched a small force to Grafton, W. Va., under Col. Porterfield, with the purpose of breaking the Baltimore & Ohio R.R. On 26 May Gen. McClellan threw troops from Ohio and Indiana into the State, defeating Porterfield at Philippi, 3 June. West Virginia seceded from Confederate Virginia 17 June, and set up a State government which was recognized by President Lincoln on the 26th. On 9 July United States senators were elected, and on the 13th they took their seats at Washington.

Kanawha Valley, Gen. Robert E. Lee was ordered to the command of West Virginia. The campaign for regaining the State failed, and by November the Confederate authorities decided to abandon the plan of occupying it. Gen. Lee was ordered to the command of the Department of South Carolina, Georgia, and Florida.

Early in July the army in front of Washington under Gen. Irwin McDowell prepared to move against the main Confederate army under Gen. Beauregard in front of Manassas. The flanks of each army toward the Shenandoah were protected by strong forces, Gen. Robert Patterson commanding on the Union side, and confronting Gen. Joseph E. Johnston.

The Union advance was hastened by an almost universal cry in the North of "On to Richmond!" Gen. McDowell left his camps on the Virginia side of the Potomac on the afternoon of 16 July with five divisions, encountering an advance brigade of Beauregard's army at Fairfax Court-House. This, with two other

CIVIL WAR IN AMERICA

brigades, withdrew with light skirmishing to the main lines, which had been established behind Bull Run, its right at the crossing of the railroad from Manassas to Alexandria, and its left at the crossing of the Warrenton turnpike from Alexandria. McDowell's forces were concentrated about Centreville on the 18th, and one brigade had quite an affair on that date at Blackburn's Ford. On the 20th Gen. Johnston arrived with all except one brigade of his army and assumed command. On the 21st McDowell, feinting in front, turned the Confederate left, and maintained a successful battle until near four o'clock, when the last brigade (three regiments) of Johnston's army arrived with a battery on the Union right and checked its advance. A brigade of Gen. Beauregard's troops moving farther to the left and more directly on the Union flank, changed this check into a retreat, which soon became a panic, and the entire Union army left the field in disordered haste. There was slight pursuit, but the panic increased, and only ended when the army was inside the fortifications of Washington. The North was astounded at the result, and the South correspondingly elated. Both sections immediately redoubled their efforts to prepare for vigorous war. Gen. McClellan was summoned from West Virginia and given command of the Department of the Potomac, and began to organize the troops pouring in from all parts of the North. On 20 August he took command of the Army of the Potomac, then for the first time organized under that title, and 1 November he was made commander-in-chief of the armies of the United States in place of Gen. Winfield Scott, who had asked to be retired on account of failing health. In the rapid organization going forward in both sections, the South had the advantage of the services of the majority of regular officers from that section who resigned their commissions and went with their States.

After Bull Run there was little heavy fighting during the remainder of 1861, both sides devoting their chief attention to establishing their lines. On 15 August Jefferson Davis ordered all Northern men to leave the South within 40 days; and the next day President Lincoln proclaimed the seceded States in insurrection and prohibited all intercourse. On the Union side, Gen. Butler in command of a joint expedition of land and naval forces, sailed from Fort Monroe, and 29 August captured the forts guarding Hatteras Inlet, opening the way to Pamlico Sound. On the lines of the Army of the Potomac the Union forces under Col. E. D. Baker, senator from California, were defeated at Ball's Bluff, 21 October, Col. Baker being killed. On 7 November a joint expedition from Annapolis, under Gen. Thomas West Sherman and Admiral S. F. Dupont, captured Port Royal, thus securing one of the most important harbors on the Southern coast. Gen. E. O. C. Ord, with a Union brigade, defeated a brigade under J. E. B. Stuart at Dranesville, 20 December. Gen. N. P. Banks succeeded Gen. Patterson in the Shenandoah; Gen. Rosecrans commanded in West Virginia.

On 29 Nov. 1861 Gen. Quincy A. Gillmore was ordered to reconnoiter Fort Pulaski, at the mouth of the Savannah River. On 1 December he reported that it could be reduced with batteries at 1,700 yards' distance, a third greater than foreign authorities laid down as practicable

against permanent works. His batteries opened 10 April 1862, breached the walls within 24 hours, and the fort surrendered 11 April.

Gen. Robert Anderson was assigned to the Department of Kentucky 28 May. His headquarters were fixed at Cincinnati on account of the position of Kentucky in regard to neutrality, but on 1 September his headquarters were moved to Louisville. On 8 October Gen. Anderson's health failing, Gen. W. T. Sherman succeeded to the command of the Department of the Cumberland. On 9 November this Department was discontinued, and under the title of the Department of the Ohio, embracing the States of Ohio, Michigan, Indiana, and most of Kentucky and Tennessee, Gen. D. C. Buell was assigned to the command, which he assumed 15 November. Gen. Ulysses S. Grant was ordered to the District of Southeastern Missouri with headquarters at Cairo, Ill., which he reached 4 September. On the 6th he seized Paducah at the mouth of the Tennessee, and 7 November was defeated in an expedition to Belmont. Gen. J. C. Frémont was ordered to Missouri, and assumed command 25 July. Before his arrival Gen. Lyon had moved against forces under Gen. Sterling Price with which ex-Governor Jackson was seeking to regain the State, and in the battle of Wilson Creek, 10 August, where Gen. Ben McCulloch commanded, Lyon was killed and Price occupied southern Missouri. Frémont, upon assuming command, advanced against Price, and occupied Springfield. Gen. H. W. Halleck succeeded Frémont, assuming command 19 November. Gen. David Hunter then in command at Springfield withdrew under orders, leaving the Confederates in possession of southern Missouri for the rest of the year.

On the Confederate side, Gen. Joseph E. Johnston commanded the Army of Northern Virginia, "Stonewall" Jackson was in the Shenandoah, Gen. Robert E. Lee in West Virginia until November, Gen. Humphrey Marshall and Gen. G. B. Crittenden in eastern Kentucky, Gen. A. Sidney Johnston at Bowling Green, Gens. G. J. Pillow, J. B. Floyd, Simon B. Buckner, and N. B. Forrest at Fort Donelson, Gen. Leonidas Polk at Columbus, Ky., and Gen. Price in Missouri. Thus stood the opposing lines at the close of 1861. Half the year had been spent in establishing them. The campaigns of 1862 began early and were prosecuted with the greatest vigor on both sides.

From January to April Gen. H. H. Sibley, with Texas forces, was engaged in attempting to secure New Mexico to the Confederacy. He inflicted much loss on Union posts and commands under Gen. E. R. S. Canby, but abandoned his purpose the middle of April and retired to Fort Bliss.

On 6-8 March a severe battle occurred at Pea Ridge, or Elkhorn Tavern, Ark., between the forces of Generals S. R. Curtis and Earl Van Dorn, resulting in the retreat of the latter.

As Gen. George H. Thomas was concentrating to attack Gen. Crittenden at Beech Grove, Ky., opposite Mill Springs on the Cumberland River, the latter marched at night from his entrenchments and attacked Thomas at Logan's cross roads the morning of 19 January. The Confederates were defeated, pursued to the river, and dispersed. This, with Gen. J. A. Garfield's movement up the Big Sandy, and his defeat of

CIVIL WAR IN AMERICA

Humphrey Marshall at Prestonburgh, 10 January, broke the right of the Confederate line through Kentucky. On 6 February Admiral Foote's fleet, supported by Grant's forces, captured Fort Henry on the Tennessee, and Grant's army, moving at once to Fort Donelson on the Cumberland, forced its surrender on the 16th, with about 15,000 men. Gen. A. Sidney Johnston then evacuated Bowling Green 15 February, and Gen. Leonidas Polk withdrew from Columbus 3 March, the movements of the latter being hastened by Gen. John Pope's advance on New Madrid and Island No. 10. This latter was captured 7 April. The Confederate forces in Kentucky and Tennessee then withdrew to the line of the Memphis & Charleston R.R., Gen. Johnston establishing his headquarters at Corinth. Gen. Buell, moving rapidly from Kentucky, occupied Nashville, 25 November. Gen. Johnston, learning that Buell was to join Grant, whose army had been brought from Fort Donelson to Pittsburg Landing, and was

found that the Confederates had already evacuated the place. After a short pursuit, under Pope and Buell, as far as Blackland, the Union army was concentrated at Corinth, and extensive fortifications were erected. The army was soon divided, and Buell with the Army of the Ohio was sent toward Chattanooga, with orders to repair the railroad as he advanced. Gen. Braxton Bragg, who had succeeded Beauregard, proceeding to Chattanooga by way of Mobile and moving rapidly north behind the Cumberlands, compelled Buell to withdraw to the Ohio River to protect his department, which included Indiana, Ohio, and Michigan. Gen. E. Kirby Smith, at the same time, invaded Kentucky by way of Cumberland Gap, defeated Union forces at Richmond, 30 August, and threatened Cincinnati. Buell, upon reaching Louisville, advanced upon Bragg. On 8 October resulted the battle of Perryville, by which Bragg was compelled to abandon Kentucky. Passing through Cumberland Gap, he retired to Chattanooga,



camped there awaiting Buell, marched from Corinth to attack Grant before the junction could take place. The Union army was unexpectedly attacked 6 April at Shiloh Church, two miles and a half in front of Pittsburg Landing and forced back to the immediate vicinity of the landing. The advance of Buell arrived about sundown, and during the night four divisions, three of Buell's army and Lew Wallace's of Grant's, reached the field. The next day the Confederates under Gen. Beauregard, being largely outnumbered, were defeated and returned to Corinth. Gen. A. Sidney Johnston was killed near the close of the first day's fight.

Gen. Halleck arrived from St. Louis 11 April and took command. Gen. Pope's army was brought from Island No. 10. On 30 April an advance began on Corinth by slow approaches. The Confederates brought Price and Van Dorn from west of the Mississippi. On 30 May Gen. Halleck's lines were close to the city, and an attack was meditated, when it was

whence he advanced to Murfreesboro in central Tennessee, and went into winter quarters.

During the operations at Pittsburg Landing and Corinth Gen. O. M. Mitchell advanced with a division from Murfreesboro 5 April, reached Huntsville 11 April, and seized the Memphis & Charleston R.R. from Decatur to Bridgeport. Gen. J. S. Negley's brigade crossed the mountains and bombarded Chattanooga 7 June. Mitchell's operations drew Gen. E. Kirby Smith from east Tennessee, and left the way open for Gen. G. W. Morgan at Cumberland Ford, Ky., to seize Cumberland Gap.

In September Price and Van Dorn, who had previously joined Beauregard from beyond the Mississippi, moved against Grant and Rosecrans in the region of Corinth. Price was defeated by Rosecrans 19 September, at Iuka, and Van Dorn, supported by Price, 4 October, at Corinth. From this campaign Rosecrans was sent to relieve Buell in command of the Army of the Cumberland, then styled the Fourteenth

CIVIL WAR IN AMERICA

corps. On 30 October Gen. Rosecrans relieved Gen. Buell, and concentrated his army at Nashville. On 26 December he moved toward Murfreesboro to attack Bragg. The battle began on the last day of the year, and continued during the days of 1-2 Jan. 1863. Gen. Bragg retreated the night of 3 January, eventually taking up positions at Shelbyville, Tullahoma and Wartrace. Gen. Rosecrans occupied Murfreesboro. The respective armies remained on these lines until Rosecrans' advance in June 1863.

While Rosecrans was succeeding at Murfreesboro, there was a noted Confederate victory at Galveston. Gen. Magruder, with a fleet of ordinary river boats, protected with hay and cotton bales, captured the Harriet Lane 1 January, sunk the gunboat Westfield, and received the surrender of the forces holding the city. The Confederate Alabama, arriving shortly after, captured the gunboat Hatteras.

Both river fleets of armored and unarmored gunboats, mortar-boats, and rams were actively engaged on the western rivers. The Union fleet, Commodore A. H. Foote, was composed of 45 vessels of various classes, and 38 mortar-boats. The Confederate fleet, Commodore Montgomery, was somewhat less, but contained several formidable vessels. Commodore Foote's gunboats captured Fort Henry on the Tennessee, and played an important part at Fort Donelson, Pittsburg Landing, and New Madrid. Commodore Montgomery awaited Foote's fleet, now under the command of Commodore C. H. Davis, before Memphis. The Union fleet was made up of 5 gunboats with 68 guns, and 4 rams; the Confederates of 8 gunboats with 28 guns. After a desperate battle, 6 June, against great odds, the Confederate flotilla was destroyed, and Memphis surrendered to the fleet. Davis left Memphis 29 June, and 1 July reached Young's Point, where he joined Admiral David G. Farragut's fleet from New Orleans, which had run the Vicksburg batteries.

The year 1862 opened at the east with very general dissatisfaction over the long inaction of Gen. McClellan. Gen. Joseph E. Johnston was at Manassas and Centreville with some 50,000 men, but Gen. McClellan, misled by his secret service, continually insisted that there were three times that number. The Army of the Potomac numbered fully 150,000 present for duty. The Potomac was blockaded, and the Confederate flag floated on Munson's Hill in sight of Washington. On 31 January President Lincoln gave McClellan a peremptory order to move on Manassas not later than 22 February. McClellan asked leave to present a plan of his own for a movement down the Potomac, up the Rappahannock, across to York, and thence to Richmond. While he was discussing it, Johnston, placing "Quaker guns" in his embrasures at Centreville, withdrew unmolested behind the Rappahannock to a line of works and field depot already prepared.

Just as his movement began occurred the ominous attack, 8 March, of the Confederate ironclad Merrimac, Flag Officer Franklin Buchanan, which suddenly moved out from Norfolk and attacked the Union fleet in Hampton Roads, sinking the frigate Cumberland, capturing and destroying the frigate Congress, doing much other damage, and startling the entire eastern coast. On resuming operations the next

day the Merrimac was met and foiled by the Monitor, Lieut. John L. Worden, which had just arrived. The Merrimac then retired to Norfolk, being blown up when the Confederates evacuated that city, 9 May.

McClellan was allowed to undertake his Peninsula campaign. On 11 March he was relieved from the general command of the armies. The Army of the Potomac was transported to Fort Monroe, and the movement up the peninsula toward Yorktown began 4 April. Heavy rains caused delays from the start. It was found at Washington that the designated number of men had not been left for the proper defense of the capital. McDowell's corps was therefore retained. Arriving before Yorktown with about three times the strength of the enemy, he concluded to lay regular siege to the position. Parallels were therefore opened, nearly 100 heavy siege guns were brought up, and at the end of a month, as his batteries were about to open, Gen. J. E. Johnston evacuated the place 3 May and withdrew toward Richmond. He halted at Williamsburg, where on the 5th an unsupported attack was made upon his lines, and at night he withdrew toward Richmond. McClellan followed to the Chickahominy. On 15 May the Union fleet in the James made an unsuccessful attack on Drewry's Bluff, eight miles below Richmond. On 20 May the right of his army crossed the Chickahominy and advanced to Seven Pines, or Fair Oaks, about five miles from Richmond, where he was attacked by Gen. Johnston 31 May. The prompt advance of Sumner's corps from the other side of the Chickahominy prevented serious disaster. At the close of the day Gen. Johnston was badly wounded and carried from the field. Gen. Gustavus W. Smith commanded temporarily, and was succeeded 2 June by Gen. Robert E. Lee, who continued in command of the Army of Northern Virginia until Appomattox. On 1 June the battle was renewed by the Confederates, the troops regained their lost ground, and Lee withdrew to the fortifications of Richmond.

On 16 June the Union forces on James Island in Charleston harbor, under Gen. Benham, met with a severe repulse at Secessionville. Gen. "Stonewall" Jackson, by a brilliant campaign in the Valley, had prevented the most of McDowell's corps, then in the vicinity of Fredericksburg, from reinforcing McClellan. By moving rapidly down the Valley he defeated Banks at Winchester and forced him across the Potomac, 26 May. Returning, he defeated Gen. J. C. Frémont at Cross Keys, 8 June, on one flank, and Gen. James Shields at Port Republic, 9 June, on the other, and after a week spent in deceiving Gen. Frémont into the belief that he was about to advance down the valley, by a rapid and unsuspected movement he appeared 25 June at Ashland on the flank of McClellan's army in front of Richmond. Then followed the Seven Days' battles, beginning with Mechanicsville 26 June, and ending at Malvern Hill 2 July, whence the Army of the Potomac withdrew to Harrison's Landing on the James. The only victories of the series were the first and last battles. The Peninsula campaign had ended as a disastrous failure. Gen. McClellan had been relieved from the command of all the armies 11 March, retaining that of the Army of

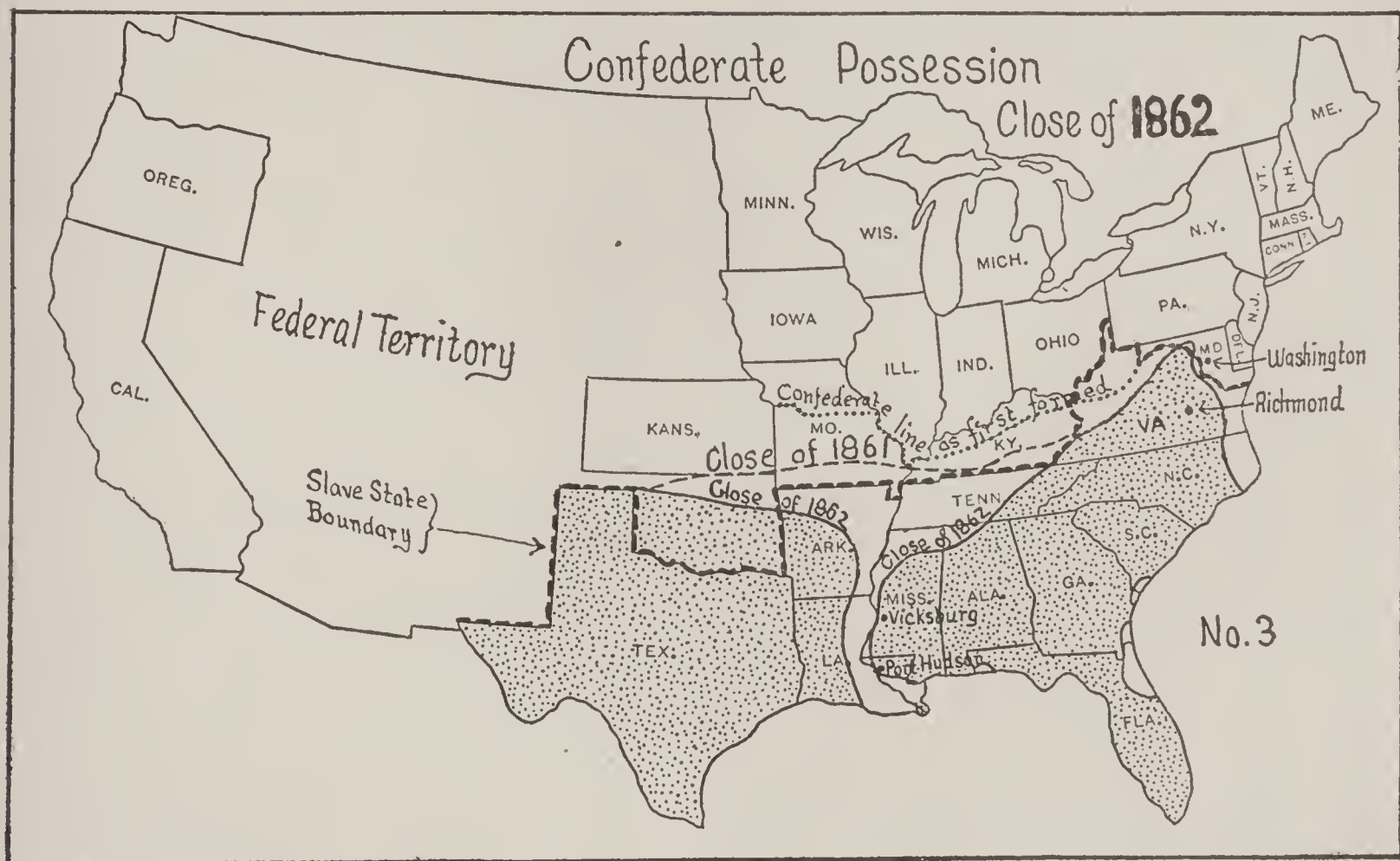
CIVIL WAR IN AMERICA

the Potomac, and Halleck assumed the chief command 23 July.

Against McClellan's protest, it was decided to withdraw his army from the Peninsula to the vicinity of Washington. To cover this movement, and protect Washington, Gen. John Pope was given command of the Army of Virginia, organized with the corps of McDowell, Banks, and Frémont. Pope concentrated his army north of Culpeper, and began with his cavalry to operate toward Lee's railroad communications at Gordonsville. Lee, though McClellan's army was still within striking distance of Richmond, at once sent a portion of Jackson's and Gen. James Longstreet's corps to Gordonsville. Pope took the field 29 July, and threatened Gordonsville again. "Stonewall" Jackson advanced on the 7th, reaching Cedar Mountain on the 9th. Here Banks attacked and was defeated. Jackson retired beyond the Rapidan, and upon Lee, with Longstreet, coming up, Pope retired behind the Rappahannock. By a long

battle of Chantilly. Pope then, under orders, 2 September, withdrew his army to the fortifications of Washington.

Pope was then relieved; his forces were added to the Army of the Potomac, and McClellan took command of the combined army. The first Confederate invasion of the North followed. On 3 September Lee put his army in motion from Chantilly toward the Potomac. The crossing was accomplished in the vicinity of Leesburg on the 5th, the army moving forward to Frederick, where, on the 7th, Lee issued a proclamation setting forth that his army had come to help them regain the rights of which they had been despoiled. This was coldly received. Upon learning that the garrison of Harper's Ferry had not withdrawn, he detached forces which invested and captured that place with its garrison of 11,000 men and over 70 guns. Lee, who, with Longstreet's command, had marched to Hagerstown, turned back to hold Turner's Gap in South Mountain, but was



detour, by way of Salem and Thoroughfare Gap, Jackson moved rapidly around Pope's right and 26 July destroyed his stores at Bristoe Station and Manassas in his rear, retiring to the former battlefield of Bull Run. On the 23d Reynolds' division from the Army of the Potomac joined McDowell, and on the 25th Gen. S. P. Heintzelman's corps, two divisions, arrived, and the next day Fitz-John Porter's corps of two divisions reached Pope. The battle of Gainesville followed on the 28th, resulting in the retirement of two of McDowell's divisions. At Groveton on the 29th the head of Longstreet's forces reached the field and took part in the closing fight. All the battles of the campaign had been desperately fought by both sides. On the 30th occurred the second battle of Bull Run. Pope was defeated, but withdrew unmolested to Centreville beyond Bull Run. Here he was joined by the strong corps of Sumner and Franklin from McClellan's army. A flank movement by Jackson led to the

defeated on the 14th and fell back to Sharpsburg, where he was subsequently joined by the forces detached against Harper's Ferry.

McClellan advanced from Washington 5 September toward Frederick, Md., the right wing and centre passing through that place on the 13th, the right moving to Turner's and the left to Crampton's Gap. Both these positions were carried on the 14th after sharp fighting. On the 15th Lee took position on the high ground beyond Antietam Creek, and in front of Sharpsburg. Gen. Joseph Hooker's corps attacked his left toward evening of the 16th, the fighting continuing until after dark. The general engagement began at daylight on the 17th, lasting for 14 hours, the losses being greater than for any one day's fighting of the War. The advantages were with the Union army, though Lee maintained his lines during the 18th, but at night withdrew and crossed the Potomac, ending the first invasion of the North. Lee remained a month about Winches-

CIVIL WAR IN AMERICA

ter, and upon the Union Army's crossing into Virginia and moving toward Winchester he took position behind the Rappahannock.

Near Warrenton, 7 November, McClellan was superseded by Gen. Ambrose E. Burnside, under an order dated 5 November. The latter took position opposite Fredericksburg 19 November, and, 13 December, forced a crossing into the city and below it. After great slaughter, largely incurred in assaults on Marye's Heights, he was repulsed and obliged to recross the river. The next month he attempted to cross above Fredericksburg and turn Lee's left. An unusual storm made advance impossible, the army finding itself actually stalled, the movement becoming known as the great Mud March. After this failure Burnside was relieved by Hooker 26 Jan. 1863.

The navy was active and effective throughout 1862. The blockade became exceedingly stringent for the Confederacy; warlike and commercial supplies alike were very difficult to obtain. On 11 January Gen. Burnside and Commodore L. M. Goldsborough sailed from Fort Monroe, capturing Roanoke Island 5 February, Newbern, 14 March, and taking Fort Macon with its garrison 26 April.

Gen. Butler and Admiral Farragut sailed from Fort Monroe 25 February for a move against New Orleans. After a terrific engagement, participated in by Commander D. D. Porter with his mortar-boats, and in which the Confederates exhibited great endurance, the chain across the river below forts St. Philip and Jackson was cut, and 24 April Farragut forced his fleet past the forts, and after terrific fighting, during which the *Varuna* was sunk by the fire of the forts, appeared before New Orleans on the 25th, Gen. Lovell, who held the city with a small force, some 3,000, retiring. Gen. Butler arrived with his troops 1 May, and took full possession, taking Baton Rouge 9 May, and Natchez on the 13th, neither being fortified. Farragut's fleet then ascended the Mississippi. He ran past the batteries at Vicksburg and joined Commodore Foote's (Davis') fleet from Memphis at Young's Point. Retiring to New Orleans, thus running the Vicksburg batteries a second time, he found letters from Washington urging him to clear the Mississippi. On 25 June his fleet, with Porter's mortar fleet, was assembled at Vicksburg, and on the 28th, after a short engagement, two ships and five gunboats ran the batteries and again joined Davis' fleet above the city. On 15 July the Confederate ironclad *Arkansas* came out of the Yazoo, ran directly through the Union fleet, none of its vessels having steam up, and gained the shelter of the Vicksburg batteries. Farragut ran the batteries that night, and attempted to destroy the *Arkansas* while passing the city wharves, but failed. On 20 July his fleet was ordered to New Orleans, where it arrived on the 29th.

Grant, from Corinth, 1 November, began his first move against Vicksburg, by ordering his troops forward to Grand Junction, purposing to move along the railroad by way of Holly Springs and Grenada to the rear of the city, while Sherman should co-operate from Memphis. A raid by Forrest destroyed long reaches of railroad above Jackson, and the destruction of the depot of supplies with its immense stores at Holly Springs, 20 December, by Van Dorn,

effectually paralyzed Grant's advance toward Vicksburg.

During Forrest's and Van Dorn's operations east of the Mississippi Gen. T. C. Hindman, in Arkansas, attacked Gens. F. J. Herron and J. G. Blunt at Prairie Grove, but retreated after a severe engagement. On 16 December Gen. N. P. Banks relieved Gen. Butler at New Orleans.

Sherman was then sent, 20 December, from Memphis down the Mississippi to ascend the Yazoo and attempt the capture of the left flank of the defenses of the city at Haines' Bluff. He assaulted at Chickasaw Bayou, 29 December, with disastrous results, and returned to the mouth of the Yazoo, where he was met by Gen. J. A. McClernand with orders to assume general command. This officer at once moved up the Arkansas River with Porter's gunboat fleet and Sherman's and G. W. Morgan's corps, captured Fort Hindman 11 January, and returned to Young's Point. From this position the Vicksburg campaign of 1863 began, which opened the Union operations of that year.

The first attempt was to cut a canal across the peninsula opposite Vicksburg, which would allow the army to move below Vicksburg. After working on this from 22 January to 7 March, a flood destroyed it. Efforts were next made to open a way through Lake Providence to the Red River, making a circuit of 350 miles to a point below the city. Both this plan and one for the east side through the Yazoo pass leading to the rear of the city, being actively opposed by the Confederates, and found otherwise exceedingly difficult, were abandoned.

A way was finally found from Milliken's Bend by way of New Carthage to a point on the river opposite Bruinsburg. On the night of 16 April the memorable running of the Vicksburg batteries by the fleet of Admiral Porter, convoying transports, was successfully accomplished. The means of ferrying his forces over the Mississippi being thus secured, the advance of the army crossed 30 April. Port Gibson was captured 1 May, after a stubborn and most gallant defense against a greatly superior force by Gens. Bowen, Baldwin, and Cockrell. Grant was then on solid ground in rear of Vicksburg.

He moved at once to intervene between Pemberton at Vicksburg and Johnston, who was seeking a junction with Pemberton. Johnston was forced out of Jackson by Sherman's and Gen. James B. McPherson's troops 14 May. Grant then turned toward Pemberton, advancing from Vicksburg, defeated him at Champion's Hill on the 16th, again at Big Black Bridge on the 18th, whence Pemberton withdrew into Vicksburg, followed by Grant. On the 19th Grant ordered an assault, which was repulsed, and again on the 22d, with the same result. A regular siege was then undertaken, and Pemberton's army was starved out and surrendered 4 July.

On 24 May 1863, Gen. J. M. Schofield, who had been active and prominent in Missouri from the first, relieved Gen. Curtis in command of the Department of the Missouri. During the Vicksburg campaign he sent all troops that could be spared to Grant. Upon their return he was able to advance Gen. Steele to the line of the Arkansas and hold it thereafter. During 8-14 June Grant received a division from Gen. S. A. Hurlbut's command, under Gen. Sooy

CIVIL WAR IN AMERICA

Smith, one from the Department of the Missouri, under Gen. Herron, and two divisions of the Ninth corps under Gen. J. G. Parke. During the operations of Gen. Grant about Vicksburg Gen. Banks was active in Louisiana. After three unsuccessful attempts against Port Hudson, which he twice assaulted, it finally surrendered, 8 July, upon hearing of the capture of Vicksburg.

In January, February, and March 1863, the Union ironclads under Admiral Dupont made unsuccessful attacks upon Fort McAllister in the Ogeechee River, but in one of them destroyed the noted blockade-runner Nashville. The Confederates were active on the North Carolina coast early in 1863, Gen. Hoke capturing Plymouth 20 April.

The campaign of the year in the Army of the Potomac was opened by Hooker. On 28 April Gen. John Sedgwick's corps was thrown across the Rappahannock at Fredericksburg, the rest of his army crossing above at Kelly's

forced further to the rear. The 4th passed without an engagement, as Lee, with the greater part of his army, was at Salem Church. The night of the 5th Hooker, thoroughly defeated, recrossed the river, and his army was reassembled at Falmouth.

On 3 June Lee, from Fredericksburg, began his second invasion of the North, Longstreet's troops leading. After minor engagements in the Valley, Gen. R. S. Ewell's advance crossed the Potomac at Williamsport 15-16 June, moved forward to Chambersburg, and had reached the vicinity of Harrisburg and Columbia on the Susquehanna, and captured York 28 June, when recalled to Gettysburg, where Lee's army was concentrating.

Meantime, the Army of the Potomac under Hooker reached the vicinity of Frederick, when Hooker, not being allowed to order the garrison of Harper's Ferry, over 10,000 strong, to join him, asked to be relieved, and Gen. George G. Meade succeeded him. The two armies met



ford, and thence advancing across the Rapidan at Germanna and Ely's fords, to and beyond Chancellorsville. His force was fully twice that of Lee. On 1 May Hooker's advance fell back to Chancellorsville. On 2 May "Stonewall" Jackson's corps of three divisions was descried at different times during the day from several points of the Union line moving toward its right. No preparations were made to guard against a flank attack, though orders to that effect were early given. At 6 P.M., while the troops of the Eleventh corps holding the right were at supper, Jackson's solid columns burst upon them and disastrously routed the Union right. On the 3d Sedgwick's corps advanced from Fredericksburg to Salem Church, was defeated that afternoon, and recrossed the river on the night of the 4th. The night of the 2d Jackson, reconnoitering in front of his pickets, was mistakenly fired on by them and mortally wounded. On the 3d, by hot fighting, Hooker's lines were

at Gettysburg 1 July. A three days' battle followed. Lee retreated the night of the 3d, but succeeded in recrossing the Potomac without a battle, and after a month's rest in the Shenandoah, resumed his former lines behind the Rappahannock. (See GETTYSBURG, BATTLE OF.) Meade followed later to that stream. With the exception of the Mine Run campaign, 26 November to 2 December, inaugurated by Gen. Meade, but without important results, both armies remained in their camps until the spring of 1864.

The campaign of the Army of the Cumberland for 1863 began 23 June, the objective being the recovery of middle Tennessee. The Union army under Rosecrans held the line of Stone's River, headquarters at Murfreesboro; the Confederates under Gen. Bragg, the general line of Duck River, with headquarters at Tullahoma. By feinting against Bragg's left at Shelbyville and turning his right, both flanks being established in entrenched camps, Bragg was

CIVIL WAR IN AMERICA

forced out of his lines and retreated over the Cumberlands and across the Tennessee to Chattanooga. It was chiefly a strategic campaign, carried on in continuous rains of most unusual severity, occupying nine days, and involving a total loss of only 560 killed, wounded and missing. The Union line advanced to the western base of the Cumberland Mountains.

The succeeding campaign, having Chattanooga for its objective, required extensive repairs to the railroad and an accumulation of supplies sufficient for leaving a base for a month, and moving in a mountainous region largely barren. The movement began 16 August. Bragg was at Chattanooga. Rosecrans' army lay along the western base of the Cumberlands from Winchester to McMinnville. Rosecrans feinted with his left corps, Gen. T. L. Crittenden's, by throwing it from McMinnville over the mountains, its advance being into the valley of the Tennessee above Chattanooga. This led to the belief that a junction was to be formed with Burnside from Knoxville, or an attack made upon the city from that quarter. Bragg, as a result, fixed his attention upon this move. Meantime the centre corps, Thomas', and the right, Gen. A. McD. McCook's, crossed the Cumberlands and the Tennessee River some 30 miles below Chattanooga, continued over the Sand Mountains, and ascended the Lookout range—all bold mountains with palisaded summits crossed only by very difficult and widely separated mountain trails. When Rosecrans' columns were ascertained to be on Lookout, Bragg, 7 and 8 September, withdrew from Chattanooga, the heads of the Union columns having in the meantime descended into McLemore's Cove, south of Chattanooga. Upon Bragg's reaching Lafayette, 26 miles south of Chattanooga, he awaited Longstreet's arrival from Virginia, meantime unsuccessfully demonstrating against Rosecrans' centre and left east of Lookout in the valley of the Chickamauga. Crittenden's corps, after having accomplished its diversion, had crossed the Tennessee, left one brigade in Chattanooga, 9 September, and moved south through Rossville to a position on Rosecrans' left at Lee and Gordon's Mill on the Chickamauga. Bragg, strengthened by Longstreet, started back 17 September toward Chattanooga, seeking to interpose between Rosecrans and that city. Rosecrans, by a night march, 18 September, proceeded toward Chattanooga, formed his lines between Bragg and the city, nine miles south of it, at Chickamauga. A two days' battle, 19 and 20 September, ensued for the possession of the roads to Chattanooga. At noon of the second day Longstreet broke through a gap at the centre of the Union lines, cut off two divisions of the right wing, and forced them with fragments of other divisions from the field, Rosecrans, McCook, and Crittenden being caught in the break. Gen. Thomas, with the greater part of seven divisions, held the field, and at night withdrew to Rossville and there reformed the army between Bragg and the city, thus securing its possession without further fighting. Bragg advanced on the 22d, and formed his lines in front of the city, which Rosecrans soon rendered impregnable by heavy earthworks. Bragg's lines embraced Lookout Mountain and Missionary Ridge, heights overlooking the city, the mountain position closing the river line of supplies. The sit-

uation of the Union army soon became precarious for want of food and forage. Hooker, with the Eleventh and Twelfth corps was ordered from the Army of the Potomac, reaching Bridgeport 30 September; and Sherman, with four divisions from the vicinity of Vicksburg. Grant was assigned to general command, arriving 23 October. Rosecrans was replaced by Gen. George H. Thomas 19 October. The river line of supplies was opened 28 October upon a plan devised by Gen. Rosecrans and executed by Gen. W. F. Smith, Hooker being brought forward to Lookout Valley, and troops from Chattanooga forming a junction with him. The battle of Chattanooga occupied three days. On 23 November Thomas, in the centre, threw forward one division, supported by four, and captured the advanced line of Bragg. The night of the 23d Sherman crossed the river six miles above the city and seized an unoccupied range overlooking the north end of Missionary Ridge. On 24 November Hooker carried the western and northern slopes of Lookout Mountain, and the next day moved against the south end of Missionary Ridge. The afternoon of 25 November Thomas, at the centre, assaulted Missionary Ridge, his storming line being two and a half miles front, carried the earthworks at the foot of the ridge, and next the ridge itself, capturing 37 guns on the summit, and forcing a general retreat. From this time Chattanooga remained in Union control to the close of the war. (See CHATTANOOGA, BATTLE OF; CHICKAMAUGA, BATTLE OF.)

The same day that Rosecrans started from Winchester, Tenn., for Chattanooga, Burnside with the Army of the Ohio (Twenty-third corps) left Lexington, Ky., for Knoxville, Tenn., his Ninth corps being still with Grant near Vicksburg. He reached Knoxville 2 September. Being ordered to assist Rosecrans at Chattanooga, he was held by demonstrations of a small force from making the junction. On 4 November Bragg despatched Longstreet's corps from Chattanooga to besiege Knoxville. On the 29th he assaulted Fort Saunders and was repulsed with serious loss. Sherman, who was sent by Grant from Chattanooga after the success there, now approaching, Longstreet retreated to Virginia. On 16 December Burnside was relieved and ordered to recruit the Ninth corps, which was assembled at Annapolis.

Throughout these operations both Union and Confederate forces in Charleston harbor had been engaged in formidable attack and most stubborn and brilliant defense. Gen. Gillmore, who had reached Charleston 12 June, immediately undertook engineering and siege work of unprecedented character as to success at long ranges; and finally, after several severe repulses, forced the evacuation of Fort Wagner 7 September, and soon shells reached the city from his long-range guns. While some of these fell in Charleston 31 August, the regular bombardment began 16 November.

On 28 Jan. 1864, Gen. Rosecrans was ordered to relieve Gen. John M. Schofield in Missouri, the latter being assigned a little later to the command of the Department and Army of the Ohio at Knoxville. Gen. Rosecrans repulsed the invasion of Gen. Price, and then sent troops not needed to Gen. Thomas at Nashville. On 20 February an expedition sent from Charleston to Florida by Gen. Gillmore under

CIVIL WAR IN AMERICA

Gen. Seymour, was disastrously defeated by Gen. Finegan at Olustee. From February to December 1864, Gen. Forrest was active throughout west Tennessee and northern Mississippi and Alabama, performing much brilliant cavalry service, to the continued disturbance of all Union commands in those regions.

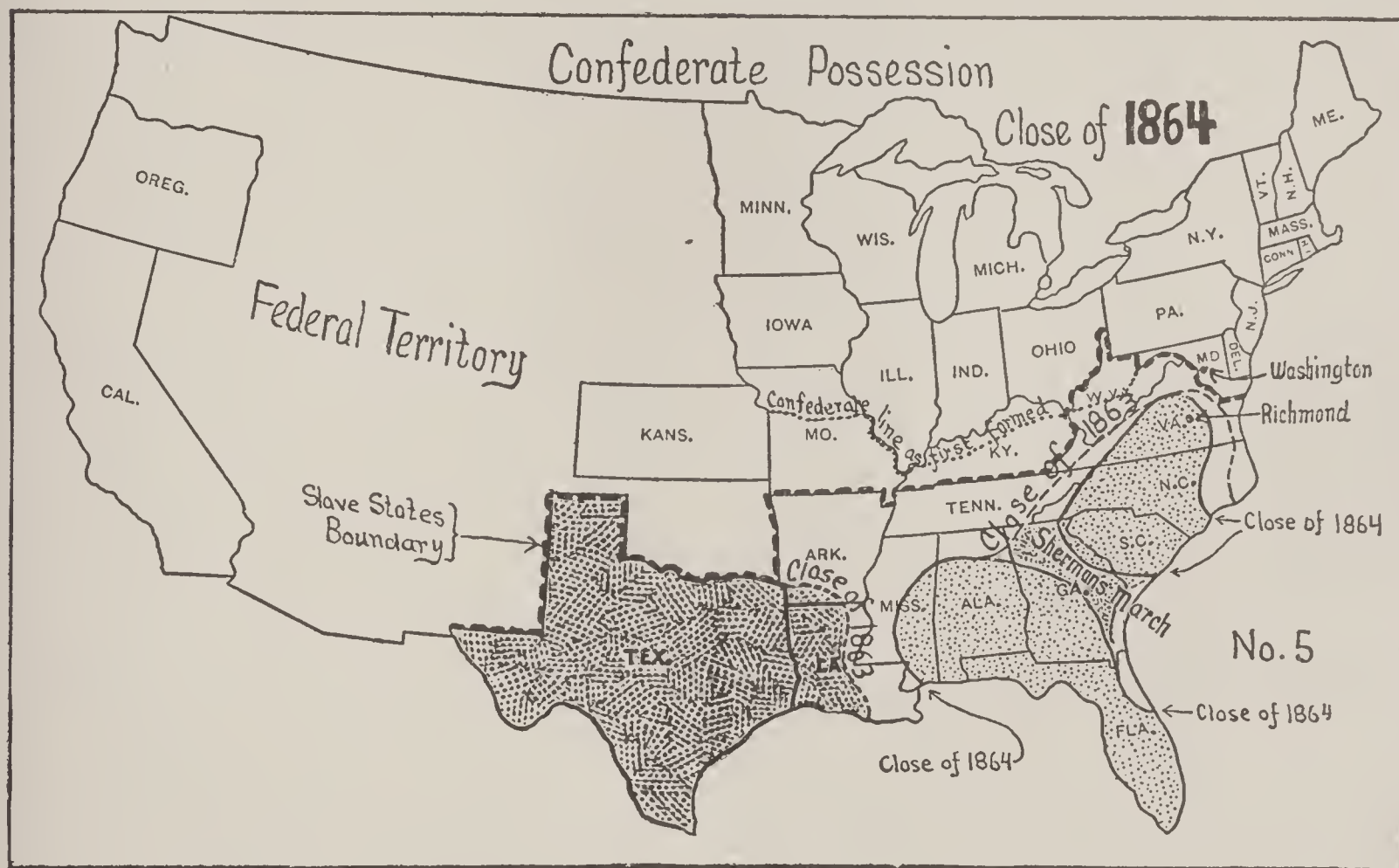
Early in the spring of 1864 Banks, supported by Admiral Porter's fleet, was ordered to advance up the Red River. At Sabine Crossroads 8 April, he was defeated and driven back to Pleasant Grove, and thence to Pleasant Hill 13 April, where A. J. Smith, from Sherman's army, re-enforced him. The fleet narrowly escaped capture by the falling of the river, and altogether the campaign was a decided failure. The defeat of Banks enabled the Confederate general, J. F. Fagan, to force Gen. Frederick Steele, who was advancing to co-operate with Banks, back to Little Rock. Banks was relieved 12 May by Gen. E. R. S. Canby.

On 12 March 1864, Gen. Grant, who had

mond by Lee's right. Sherman, with three armies, the Cumberland, under George H. Thomas, the Tennessee, under McPherson, and the Ohio, under Schofield, aggregating nearly 100,000 men, was to move against Johnston's army at Dalton and follow it. Banks was to leave the Red River country to Steele and the navy, abandon Texas, and move against Mobile with his 25,000 men, re-enforced by 5,000 from Missouri.

Grant established his headquarters with the Army of the Potomac, Meade having the full direction of the army under Grant's general orders. The Army of the Potomac moved toward the Rapidan in the early morning of 4 May, and by night all the troops had crossed.

Grant's force was about 119,000, and Lee's about 62,000. Lee pushed rapidly to his right and struck Grant's advance in the Wilderness 5 May. Terrific fighting followed till the night of the 6th. Lee pushed on to Spottsylvania, reaching it in advance of Grant and interposing on the



been commissioned lieutenant-general, that grade having been revived by Congress, was placed in command of all the armies. Early in April he had formed a plan for a combined movement of the armies to begin toward the last of the month, and had communicated the same to Meade with the Army of the Potomac, Butler at Fort Monroe, Sherman at Chattanooga, and Banks at New Orleans. The main Confederate armies were those of Lee, at Orange, with Longstreet at Gordonsville, confronting Meade in the vicinity of Culpeper, and Johnston at Dalton, Ga., facing Sherman in the vicinity of Chattanooga.

Grant's general plan was for Gillmore, from South Carolina, with 10,000 men, to join Butler at Fort Monroe, giving him 23,000 troops for a move up the James to capture City Point, threatening Petersburg and the rear of Richmond. Burnside, with 25,000 men assembling at Annapolis, was to join Meade, and the Army of the Potomac was to advance toward Rich-

line to Richmond. Both armies entrenched, and from the 8th there was bitter fighting until the night of the 20th, when Grant started for North Anna. From Spottsylvania 8 May, Sheridan, commanding Grant's cavalry, made a raid around Lee's army, encountering and defeating J. E. B. Stuart at Yellow Tavern 11 May, where Stuart was killed. Sheridan spent a day within the outer defenses of Richmond, and joined Butler on the James. Grant proceeded to move to his left, everywhere opposed by Lee, fighting heavily at North Anna and Bethesda Church, reaching Cold Harbor 2 June. On the 3d Grant assaulted along his whole line, to meet in an hour with terrible slaughter and repulse, so serious that an order for a second assault was not carried out. Grant had failed to interpose between Lee and Richmond. From Cold Harbor he sent Sheridan with his cavalry to occupy the attention of Fitzhugh Lee's and Hampton's cavalry while he withdrew to the James. Sheridan defeated both at Trevilian's Station. Grant

CIVIL WAR IN AMERICA

then moved without interruption to the James, reaching it 13 June, and crossing it in the vicinity of City Point and Bermuda Hundred. Gen. Butler had occupied these points 5 May. On the 14th Butler carried the outer defenses of Drewry's Bluff, but was thence driven back by Beauregard's troops, who had arrived from the south, and his contemplated movement toward Petersburg and the rear of Richmond was defeated. Lee occupied the Petersburg lines. Grant attacked the works several times unsuccessfully from 15 to 18 June. On 30 July an attempt on the works was made by exploding a mine. The explosion was a great success, but the assault to follow it was a failure. This was the battle of The Crater.

From the establishment of Grant's lines before Petersburg frequent and heavy fighting continued until about 1 November, but with little permanent impression on Gen. Lee's lines. The Union left, however, was extended across the Weldon R.R. On 28 September Gen. Butler, with two corps, crossed to the north side of the James and captured Fort Harrison, a position from which Richmond was seriously threatened. On 16 November Butler, supported by Porter's fleet, was sent to capture Fort Fisher, but failed. During the winter the lines of each army were greatly strengthened. On 7 December Grant had extended his left 20 miles to Hicksford on the Weldon R.R. On 22 June Gen. James H. Wilson, with two divisions of cavalry, moved against the railroads south of Richmond, destroying nearly 50 miles of track, and inflicting much other serious damage. His return route was blocked, but he brought his forces in with some loss of both artillery and trains. He had severed all railroad connections with Richmond, and they were not fully restored for several weeks. Gen. Franz Sigel's campaign began 1 May. On the 15th he moved up the Shenandoah to New Market, and was defeated, cadets from the Virginia Military Institute taking prominent part. At Grant's request Sigel was suspended and Gen. David Hunter assigned. The latter pushed on to Lynchburg, but was compelled by Gen. Jubal A. Early to retreat from that point by way of the Kanawha and Ohio rivers to Parkersburg, and thence by rail to the east. Gen. George Crook's wing of Sigel's column from the Kanawha penetrated to the Tennessee and Virginia R.R. at Wytheville.

On 6 May Gen. Sherman moved from the vicinity of Chattanooga against Gen. Johnston at Dalton. The Union army had in round numbers 100,000, the Confederates being about half as strong. After vainly attacking the gaps and ranges in front of Dalton for several days, Sherman passed his army through Snake Creek Gap leading to the rear of Dalton. This compelled Gen. Johnston to retire from his camps, and he was defeated at Resaca. Johnston resisted stubbornly at every step, but he was successively flanked out of every new position until he reached Atlanta. Fighting had been in progress at some points of the line from May till September. Johnston was succeeded by Hood 18 July, and on the 20th Hood attacked at Peach Tree Creek, and was repulsed with great loss. He then moved out of Atlanta and attacked, and was again defeated. Gen. McPherson, commanding the Army of the Tennessee, was killed. The next attack was at Ezra

Church 28 July, upon the Army of the Tennessee, this also being repulsed after three hours' severe fighting, with much loss.

On 2 September Sherman occupied Atlanta, which was evacuated as a result of his moving to the rear of the city on Jonesborough. Hood first raided Sherman's railroad communications, fighting heavily at Allatoona 5 October, and soon after moved northward. Gen. Thomas was sent to resist his movement if he invaded Tennessee, and Sherman started 15 November on his March to the Sea. While it was originally intended by Gen. Grant that he should move from Atlanta to Mobile, the harbor there having been captured 5-23 August by Farragut and Canby, he decided upon the alternative which Grant had suggested before the campaign opened, and started for Savannah.

The fight of Farragut's fleet in the harbor of Mobile, which decided Sherman's march to Savannah, was one of the most brilliant in naval warfare. The Confederate fleet was destroyed, including the far-famed ironclad ram Tennessee. Sherman reached Savannah with slight opposition. On 17 December he summoned Hardee to surrender. The latter refused, and on the night of the 20th retired with his force of 10,000 without molestation. The next morning the Union army entered.

Meantime Hood had invaded Tennessee with the entire army with which Sherman's three armies had been confronted from May till September. Gen. Thomas left with two small but excellent corps, by great exertion organized an army to oppose Hood. On 30 November Gen. Schofield, commanding in the field in front of Hood, inflicted a nearly fatal blow upon him at Franklin. After Gen. Thomas' forces were united at Nashville 15-16 December, he attacked Hood's entrenchments in front of the city and dispersed and practically annihilated his army.

The forced retreat of Hunter from Lynchburg over the mountains of West Virginia left the Shenandoah unprotected. Gen. Early entered it, drove Sigel across the Potomac, then on 9 July defeated Wallace, who was in small force at Monocacy, Md., threatened Baltimore and appeared before Washington 11 July. Here he was met by veterans of the Sixth and Nineteenth corps, Army of the Potomac, hurried to Washington by Grant, and forced into rapid retreat. Upon the withdrawal of the troops from the Army of the Potomac Early again sent a force under Gen. John McCausland, into Pennsylvania, and these invaders burned Chambersburg 30 July. Sheridan, being assigned to command, forced Early beyond Staunton; and devastating the Valley, he withdrew to Cedar Creek. While Sheridan was absent Early attacked and drove the army out of its camps. Gen. H. G. Wright, however, rallied the troops near Middletown and restored the battle. Sheridan arriving, the army advanced, and Early was so seriously defeated as to close the campaign in the Valley.

The first movement of the final campaigns of 1865 began 2 January in Tennessee, when Gen. Schofield with the Twenty-third corps left Columbia, Tenn., for Clifton on the river bound for the east. The corps left Alexandria on transports soon after 1 February, and landed at the mouth of Cape Fear River 9 February,

CIVIL WAR IN AMERICA

where the Tenth corps was established, which, under Gen. Alfred H. Terry, had captured Fort Fisher, that had been most stubbornly and gallantly defended against the army and the fleet by Gen. W. H. C. Whiting. Fort Anderson was attacked by army and fleet, and abandoned 19 February; the position of Town Creek was carried 20 February, and Wilmington was taken 22 February. Operating next by way of Newbern, Gen. R. F. Hoke was defeated at Kingston 10 March. Goldsboro was occupied by Gen. Schofield on the 21st. Sherman's army joined Schofield here on the 23d. On 26 January Gen. Terry had been despatched to co-operate with Admiral Porter in reducing Fort Fisher at the mouth of Cape Fear River. A previous expedition under Gen. Butler, 13-16 December, had failed, but the fleet had remained, and Porter had appealed to Grant to send another force. Terry's troops effected a landing above the fort 13 January. The next morning he was entrenched across the penin-

whelmed his left wing before the right wing, which was widely separated from the left, could reach it. On the 21st Johnston was defeated after sharp fighting, and Sherman marched for Goldsboro, which he reached 23 March.

On 2 March Sheridan advanced up the Valley, defeated Early at Waynesboro, and proceeded through Charlottesville and along the Richmond & L. R.R., destroying roads and stores, and joined Grant at Petersburg. Gen. James H. Wilson, operating under Gen. George H. Thomas, crossed the Tennessee 22 March with a thoroughly equipped mounted force of 12,500, and 1,500 dismounted to follow until horses could be captured. His first objective was Selma, Ala. A portion of Forrest's cavalry was encountered and defeated at Montevallo 30 March. The fortifications of Selma were carried against Forrest 2 April, and immense war supplies and plants for the manufacture of war materials destroyed. Montgomery surrendered 12 April; West Point was captured 15 April,



sula. Early on the 15th the fleet opened a terrific bombardment, which was continued until a force of marines was landed in the afternoon to co-operate in the assault of the army. This was delivered at 3.30 in the afternoon, the flank of the work next the river being carried. Then followed severe fighting for each succeeding traverse. It was not until 10 o'clock at night that the fort was finally carried. Sherman started northward from Savannah 1 February. Marching through swamps, and crossing all streams at flood, he was before Columbia on the 16th. It was surrendered without fighting the next day. Charleston, being cut off from interior communications, was evacuated by Gen. W. J. Hardee 18 February. Fayetteville, N. C., was reached 11 March. The first opposition stronger than skirmishing was at Averasboro 16 March, where Gen. Hardee made a brief stand. On 19 March Johnston's army, which had been collected on Sherman's front at Bentonville, checked his advance and nearly over-

after sharp fighting; Columbus was carried by a night assault 16 April; Macon surrendered 20 April. Here Wilson received notice of the Sherman-Johnston truce. An expedition, sent out 7 May by Wilson from Macon, under Col. Pritchard, Fourth Michigan, captured Jefferson Davis, 10 May, at Irwinsville, Ga. On 6 February the Confederates made a heavy attack at Hatcher's Run on Grant's left, but were finally repulsed with a Union loss of about 1,500. The night of 24 March Gen. J. B. Gordon made a daring and most successful assault upon the right of Grant's lines at Petersburg, capturing Fort Stedman and three strong works. These were recaptured the next day.

The Army of the Potomac was the last to move in the opening campaigns of 1865. It had occupied its lines before Petersburg without general movement from November till the last of March. The general movement, which was to the left, began on the 29th, and brought on

CIVIL WARS OF ROME — CIVILIS

the battle of Dinwiddie Court House and White Oak Road on the 31st, and the battle of Five Forks on April 1st, in which latter engagement the Confederates were defeated. On 2 April the Confederate entrenchments were carried, and Gen. Lee abandoned his lines during the night, having notified President Davis during the forenoon that he would begin a retreat on Amelia Court House that night. Jefferson Davis received this dispatch in church. He and his Cabinet immediately collected personal effects and Confederate archives, and left Richmond on a special train. Gen. Godfrey Weitzel received the surrender of the city on 3 April.

Gen. Lee's army was assembled at Amelia Court House 5 April, and continued its retreat at night. On the 6th Gen. Meade advanced on Amelia Court House, but, finding that Gen. Lee had left, he moved toward Deatonville (Sailor's Creek), where the most of Ewell's corps, the rear of Lee's army, was captured 6 April. About the same time some 10,000 men of the divisions of Anderson, Pickett, and Bushrod Johnson, were captured. Lee continued his retreat and reached Farmville on the morning of the 7th. Here his troops received their first rations since the retreat began. At 11 o'clock, Union troops appearing, the march was renewed, his men being greatly exhausted with loss of sleep, hunger, and hard marching. On this day the correspondence began between Gens. Grant and Lee, which, on the 9th, resulted in the surrender of Lee's remaining forces at Appomattox. The number paroled was 28,231 officers and men, extra duty men, and detailed men of every description, this remnant being all that was left within the control of Gen. Lee of his magnificent fighting machine, the Army of Northern Virginia.

In North Carolina Sherman and Schofield moved against Johnston, occupying Raleigh 13 April. On the 14th Johnston asked for a conference, and on the 18th terms of surrender were agreed upon, subject to the approval of the President of the United States. These, being deemed in part political, were disapproved, and Gen. Grant was sent to Raleigh to insist upon the same terms made with Lee. These Gen. Sherman demanded of and received from Gen. Johnston 26 April, and the War was over, though small independent forces were in the field for a short time thereafter, Gen. Dick Taylor, in Alabama, not surrendering to Gen. Canby till 4 May.

President Lincoln made nine calls for troops during the War. Under these about 2,800,000 men of all classes were enlisted, including emergency men of a few weeks, three, six, and nine months' men, two and three years' men, conscripts and substitutes. There were 52,000 drafted men held to service; 75,000 conscripts who sent substitutes; and 42,000 men who sent substitutes, although not themselves drafted.

The Confederate records are very deficient, having been largely destroyed. The best estimate from the data in the possession of the war department places the Confederate strength at something over 1,000,000. After Mr. Davis' calls of the first year a general conscription act was passed 16 April 1862, including all white men between the ages of 18 and 35 for the term of 3 years. On 27 Sept. 1862, this act was extended to include those of 45 years. On 17

Feb. 1864, the law was extended to those between 17 and 50, the term to be for the war.

According to the latest compilation of the record and pension office of the War Department, the total number of deaths from all causes in the Union army during the War was 359,528. As many records are incomplete, the actual number must be somewhat larger. On the basis of the figures given, there were killed in action, 67,058; died of wounds received in action, 43,012; died of disease, 224,586. The Confederate losses were quite as severe in proportion to strength, but the records are wanting to such an extent as to make definite estimates of little value.

H. V. BOYNTON.

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Civil Wars of Rome, The, in their widest extent began with Tiberius Gracchus, and terminated with the election of Octavius Augustus to the empire, 133-131 B.C. In a more limited sense they mean the contest between Caius Marius and Cornelius Sylla, or Sulla (88-78 B.C.). The original cause of the civil war was the struggle between the oligarchy and the democracy of Rome. This struggle lasted till Sylla restored the senate to sovereignty; but this sovereignty was soon disturbed by Julius Cæsar (q.v.).

Civilian, in common speech a word denoting a person whose employments are wholly of a civil character as distinguished from one who belongs to the army or navy, while in legal acceptation it designates one who is learned in civil or Roman law.

Civi'lis, Germanic leader of the Batavi in their revolt against the Romans, 69-70 A.D. At one time he held a command in the Roman army, but being more than once charged with treason he escaped and roused the Batavians, his countrymen, to rebellion. Pretending to espouse the cause of Vespasian against Vitellius, he raised a powerful army, and inflicted severe defeats on the Romans. An imposing force sent against him he routed and shut up in the military station, Vetera Castra, which after a long siege capitulated, on which all its defenders were slaughtered. Fortune at last for-

CIVILIZATION — CIVILIZATION IN EUROPE

sook him, and he had to negotiate with the Romans, the Batavians returning to their allegiance. His fate is unknown.

Civiliza'tion (from the Latin *civilis*, "like a citizen" (*civis*), that is, having the virtues or qualities of a citizen), a term that may mean many things, but is commonly applied to the upward movements of peoples toward higher intellectual, moral, social, and industrial altitudes. "Whatever," says John Stuart Mill, "be the characteristics of savage life, the contrary of these, or the qualities which society puts on as it throws off these, constitutes civilization." The word means, therefore, social progress, the improvement or perfecting of the laws, both written and unwritten, which make for security and peace, and the harmonious development of individual life. The word is often used relatively, meaning the dominant influences of the present period, as when we speak of "our civilization." The most eminent writers who have dealt with this subject have chosen to treat it in different ways. Guizot in his history writes of political or institutional progress, and thus his definition of civilization differs from that of Buckle, who, minimizing institutions as resultant forces, treats the individual as paramount. Many are the influences that determine the character of civilization. Among these Buckle places climate, soil, food, and what he terms the "General Aspect of Nature." To these influences he attaches, perhaps, undue importance, inclining to the minimizing of those innate or inherited qualities in the different races of mankind. His history is written from the view-point of a necessitarian. His theory that moral truths are stationary, intellectual truths alone progressive, and that religion has done more harm by its persecutions than good by its moral and spiritual ministrations, must be taken as showing the bias of an otherwise valuable work, the chief merit of which is its assertion of the claims of the individual against interference in the name of authority. Not all writers hold to the view that our present civilization is a development from primitive rude conditions, but, on the contrary, contend that it was the original state of mankind from which the savage races have in reality descended, and that our present civilization is therefore an artificial approximation to conditions prevailing before the descent. But the other view—namely, that civilization is a development out of barbarous beginnings—is the one commonly held.

A kind of civilization may exist based upon laws and customs which constitute a survival of barbarism, and which are working for the overthrow of institutional civilization which other forces are laboriously building up. Thus ancient civilizations, the democracies of Sparta and Athens, were based upon slavery—the civilization of much of Europe, upon a burdensome militarism that saps its strength. It is hard to say what constitutes a true civilization judged by its fruits, but it may be said to be based primarily upon respect for human rights. Wherever a society exists in which classes are deprived of the fullest participation in its opportunities, there, it may be said, true civilization cannot flourish, however brilliant may seem its achievements, however pleasing its outward countenance, however gracious its aristocracy. **Civilization is progress** (Guizot's definition)

only as society moves forward as a whole. Nor is it in its arms and powers of conquest, but in its domestic virtues that its greatness consists. Augustus did more to make lasting the greatness of imperial Rome when he strove to promote her domestic life and her civic virtues than did the long line of emperors who sought the destruction of her rival cities. Civilization is not a chain in which every link is apparent, though doubtless such links there are. With the age of Charlemagne, the old civilization receded, and the new was born. But this was so only in appearance, since the race is forever in process of development; it is at no one minute what it was the minute before. Every period marks as stupendous if invisible a change from the old to the new. The ancient bonds are not broken; they loosen and fall off. The spectacle of nations rising to greatness from small beginnings, and then slowly sinking, the prey to conquerors from without and internal forces from within, has constituted the perpetual enigma to those who have written histories of civilizations. Yet some later science of history will make the secrets of their decay and death as obvious as the methods by which in their beginnings they rose to greatness and power. The reasons will be found in the denial of natural justice and natural equality among men. From the past it may be predicted with tolerable safety that there will be progress on the whole; that the progress will be intermitted and interrupted; and that it will never, perhaps at the best, be quite as satisfactory as it might be.

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Civiliza'tion, An Introduction to the History of, a noted work by Henry Thomas Buckle, published 1857-61. Although the progress of science has uncovered facts that prove the weakness of an occasional principle in the 'History of Civilization,' the work remains one of the greatest popular contributions of modern times to the new aspect of history, as a human document, to be read by the light of scientific discovery. No book of its time was more influential in turning the direction of men's thoughts to the phenomena of social and political science.

Civilization in Europe, a history, by François Guizot. In this work Guizot begins with the fall of the Roman empire, and ends with the opening of the French Revolution. Although he analyzes all the important facts of history between the great landmark of 476 and the convocation of the States-General in 1789, he is far more anxious to grasp their import than to give a vivid relation of them; and therefore, facts in themselves play but a small part in his exposition. They are simply a help in his effort to discover the great laws that direct the evolution of humanity, and to show its development in the individual and in society. His investigations are limited to purely social development, and he does not touch upon the intellectual side of the question.

CIVITA-DI-PENNE — CLAFLIN

Civita-di-Penne, chē-vē'tā dē pěn'nā, Italy (the ancient PINNA-VESTINA), a small town in the province of Teramo, Naples, built on two hills, 29 miles east by north of Aquila. It was formerly a place of importance. The Normans, under Roger I., made it the capital of their kingdom.

Civita-Vecchia, chē've-tā vĕk'kē-ä. See CITTA VICCHIA.

Civitali, Matteo, mät-tā'ō chē-vē-tā'lē, Italian sculptor and architect: b. Lucca 1435; d. 1501. He followed the occupation of a barber until about 1470, when he suddenly rose to the highest rank among the sculptors of his time. His first important work was the mausoleum erected in the cathedral at Lucca to Pietro de Noceto, secretary to Pope Nicholas V. His greatest works are six statues of white marble in the same church, representing personages of the Old Testament. Among his architectural works is the Bernardini palace at Lucca, of simple style, and also the little temple which contains the miraculous crucifix in the church of St. Martino. He also executed a monument to Saint Romanus in the Church of San Romano. The Uffizi Gallery at Florence contains Civitali's statue of 'Faith.'

Clackmannanshire, klāk-măn'an shēr, Scotland, the smallest county, being only about nine miles long, seven wide, and comprising an area of about 35,160 acres or 55 square miles. By the recent readjustment of county and parish boundaries the parish of Alva, formerly a detached portion of Stirlingshire, was added to the county, increasing its area by over 5,000 acres. It lies on the north side of the Forth, by which it is bounded southwest. On all the other sides it is enclosed by the counties of Perth, Fife, and Stirling. The north part of the county is occupied by the Ochil Hills, but the other portions are comparatively level, and in general are exceedingly fertile, yielding large crops of oats, barley, wheat, and beans, turnips, and other green crops. The minerals are valuable, especially coal, which abounds. There are ironworks, breweries, and distilleries, woolen manufactures, tanning, glass-works, etc. The principal towns are Alloa (the largest), Alva, Tillicoultry, Dollar, and Clackmannan; the last is nominally the county town. It is rather poorly built, but has an interesting old tower and an old market-cross. Pop. (1901) 32,019.

Clacton-on-Sea, England, a popular watering-place on the coast of Essex, 15 miles southeast of Colchester, with admirable facilities for sea-bathing, and of easy access from London both by railway and steamboat. It stands on cliffs over 40 feet high, and has a town-hall, a church in the early English style; a long ocean pier, etc. Pop. (1901) 7,453.

Cladel, Léon, lā-ōñ klä-dĕl, French roman-cist: b. Montauban 1855; d. 1902. He rose suddenly into prominence with his story, 'The Ridiculous Martyrs' (1862), a satirical description of the lower walks of literature in Paris. This first success was repeated with the later novels: 'Eral the Tamer'; 'One Qouael'; the 'My Peasants' series; 'Barefoot'; 'A Woman Under Ban,' for which he suffered four weeks' imprisonment; and many others.

Cladium, klä'dī-ŭm, a genus of plants of the sedge family (*Cyperaceæ*), with about 30

species natives of tropical or temperate climes. There are only three species found in America, of which the most common is the twig-rush (*C. mariscoides*), found in marshes from Minnesota eastward to Nova Scotia, and southward to Florida. This plant is very common in certain of the fenny districts of England, where it is used for thatching.

Cladocera, klā-dōs'e-ra, a group of *Crustacea* forming a sub-order of the order *Branchiopoda*, and by some authors regarded as an independent order. It is represented by the little water-flea, *Daphnia*, in which the body, consisting of few segments, is protected by a bivalvular shell, though the head, with its antennæ, is uncovered. The legs are short and leaf-like. It lays summer and winter eggs, the latter enveloped in a peculiar shell, the "ephippium," and the young develop in a space between the shell and the back of the animal, which forms a brood-pouch.

Cladrastis, klā-drās'tis, a genus of the pea family, with two species, one in Manchuria, the other (*C. lutea*) in eastern United States. The American or Kentucky yellow-wood is a species with smooth bark, and sometimes grows above 50 feet in the rich soils of Kentucky and Tennessee. The wood, which weighs about 40 pounds to the cubic foot, is strong and hard, and of a bright yellow color. It produces a dye of considerable commercial value.

Clafin, Horace Brigham, American merchant: b. Milford, Mass., 18 Dec. 1811; d. Fordham, N. Y., 14 Nov. 1885. He received a common school education, worked in his father's store until he was of age, when he went to Worcester, Mass., and in partnership with his brother-in-law, engaged in the dry goods business on a large scale. In 1843 he established in New York the firm of Bulkley & Clafin, importers and jobbers of dry goods; in 1851 it became Clafin, Mellin & Company, and in 1864 H. B. Clafin & Company, by which it is best known. Mr. Clafin conducted an enormous business extending all over the country, and since 1864 it has been the largest mercantile business in the United States, its sales in a single year having reached \$72,000,000. Its financial strength, and the money markets' firm confidence in Mr. Clafin's methods and integrity, enabled the firm to pass safely through most of the financial crises of the last 40 years. In 1861 and in 1873 it had to ask for slight extensions of time in which to settle accounts, but all were paid with interest before maturity. Mr. Clafin was a man of domestic tastes, fond of books and horses, an attendant of Plymouth Church, Brooklyn, and an intimate friend of Henry Ward Beecher.

Clafin, Mary Bucklin, American prose writer: b. Hopkinton, Mass., July 1825; d. Whitinsville, Mass., 13 June 1896. She was the second wife of William Clafin (q.v.). For 18 years she was a trustee of Boston University; and of Wellesley College from its foundation till her death. Among her publications are: 'Brampton Sketches'; 'Recollections of Whittier'; and 'Under the Elms.'

Clafin, William, American governor: b. Milford, Mass., 6 March 1818; d. 5 Jan. 1905. He was educated in the public schools and at Brown University. For many years he was engaged in the shoe and leather busi-

CLAFLIN UNIVERSITY — CLAIM

ness in Saint Louis, Mo., but later settled in Boston, Mass. He was elected to the State House of Representatives 1849-52; to the Senate 1860 and 1861; was a member of the Republican National Committee 1864-75; lieutenant-governor of Massachusetts 1866-9; and governor 1870-2. From 1877 to 1881 he was a Republican member of Congress. The degree of LL.D. was conferred on him by Harvard and Wesleyan universities.

Claflin University, a co-educational institution in Orangeburg, S. C.; organized in 1869, under the auspices of the Methodist Episcopal Church, exclusively for the colored race. Professors and instructors, 31; students, 713; volumes in the library, 5,600; grounds and buildings valued at \$150,000; income, \$14,000; president, L. M. Dunton, A.M., D.D.

Claghorn, Kate Holladay, American writer: b. Aurora, Ill., 12 Dec. 1863. She was educated at Bryn Mawr College, and has been engaged in research work for the United States Industrial Commission. Besides contributions to periodicals, she has published 'College Training for Women' (1897).

Claiborne, klā'bōrn, or Clayborne, William, American colonial adventurer: b. Westmoreland, England, about 1589; d. about 1676. He was of good family and became surveyor of the Virginia plantations for the London Company in 1621; settled at James City, and acquired 45,000 acres of land. In 1625 he was commissioned by Charles I. a member of the colony's council, and its secretary of state. In 1628-31 he received commissions, and in 1631 a royal patent, for discoveries and trade with the Indians; and about 1631 discovered and partially planted Kent Island in Chesapeake Bay, which settlement was accorded a burgess in the Virginia Assembly. In 1632 Lord Baltimore was given his Maryland charter, saving the rights of previous settlement; and his first colony arrived in March 1634. Finding Claiborne's island within his limits, he at once claimed title to and sovereignty over it, alleging that Claiborne's patent was only a trading right, giving neither title to soil nor political rights. Claiborne, however, claimed both ownership and independence, in which Virginia sustained him. He was at this time carrying on an extensive Indian trade in partnership with a London house in armed vessels, and he endeavored to prejudice the Indians against the new colony. Capt. Cornwallis of the latter retaliated in 1635 by assailing and capturing one of his vessels, in a fight in which several lives were lost. This misfortune, and the burning of his warehouse, aroused the suspicions of his partners, who sent out an investigating agent, to whom he turned over the Kent Island property and went to England. There he was sued for account, and indicted for rebellion; but this seems not to have been pressed. Meantime the agent seized all Claiborne's Virginia property, and acknowledged Baltimore's title and sovereignty in Kent Island. Claiborne then bought Palmer's Island at the head of Chesapeake Bay, supposing it beyond Baltimore's grant, and asked the king for an injunction to restrain Baltimore from interfering with him, and for a grant of lands along the Susquehanna. The king referred it to the commissioners of plantations, who ignored the purchase, refused the grant, and sent him to

the courts for the injunction. Claiborne's party in Kent Island continuing insubordinate, Gov. Calvert reduced it and seized Palmer's Island also. Ousted from all his settlements, Claiborne petitioned for a grant of some island he might discover *within* the company's patent. This, too, was refused, but Charles made him treasurer of Virginia for life. He at once became a leading political director. During the English civil war that followed, Virginia clung to the royal cause, while Baltimore trimmed sail, and in 1644 Claiborne attempted to raise Kent Island against the proprietary government, as Roman Catholics and hostile to the king. He failed, but in 1645 an English captain, professing a parliamentary commission, overturned the Baltimore government altogether for a time. On the execution of Charles I., Virginia and Maryland, through its royalist deputy, proclaimed Charles II. Claiborne now joined the party of Parliament and was accordingly commissioned to reduce Virginia and Maryland to obedience. In 1652, accordingly, his expedition deposed Gov. Berkeley of Virginia, appointed a new governor, with Claiborne secretary of State, and forced Gov. Stone of Maryland to swear allegiance to Parliament. When Parliament was turned out by Cromwell, Stone repudiated the oath, whereupon Claiborne marched on Maryland with an armed force, deposed Stone, and appointed a Puritan administration, which at once disfranchised all the Roman Catholics. Cromwell intervened in their favor in 1654, and Stone undertook to recover his position by force, but was defeated and captured. Claiborne held his advantage till 1658, when Baltimore had his province restored to him. On the Restoration, in 1660, Claiborne was dismissed from the council and secretaryship of State. In 1675, on Cecilius Calvert's death, he petitioned the king for redress of his wrongs from the Baltimores, but no attention was paid to his request. His descendants in the South numbered many able and distinguished men, and are commemorated in town and county nomenclature. He was a man of enormous energy, resource, and pertinacity, a true type of the English adventurers who have overrun the world; but too inconsiderate and personal in policy for the largest success.

Claiborne, William Charles Cole, American senator: b. Sussex County, Va., 1775; d. New Orleans, La., 23 Nov. 1817. He received a good education, studied law, and engaged in its practice in Nashville, Tenn. He assisted in forming the constitution of Tennessee, and represented that State in Congress 1797-1801. In 1801 he was appointed governor of Mississippi Territory, and in 1804 of Louisiana. When the latter became a State and adopted its constitution, he was elected governor 1812-16. He was later elected United States senator, but died before taking his seat in that body.

Claiborne Stage, in American geology, the rocks, principally shales and limestones laid down in Middle Eocene time along the Carolinas and the Gulf States and around an arm of the sea that reached northward to the present mouth of the Ohio River. See EOCENE SERIES; TERTIARY SYSTEM.

Claim, a challenge of ownership of a thing which is wrongfully withheld from the possession of the claimant. The assertion of

CLAIMS — CLAIRVOYANCE

liability of some one, to the party making it, to do some service or pay a sum of money. The possession of a settler upon lands owned by a government which is not used for any particular purpose, and from which no benefit is derived. When a new section of country is opened up, the government gives to each settler a certain amount of land on condition that he will live there, and improve and cultivate the soil for a definite time. The land taken is called a claim, and the settler receives an absolute title to the property when the conditions have been complied with. The ground must be staked out so that the particular claim may be identified. Mining claims are of this nature. Generally it is required that they be staked out, that a description of the claim be filed, and that a certain amount of work be done within a specified time. These claims are considered personal property until the conditions are complied with, and are subject to sale and transfer, it being necessary for all but the original settler to be able to show how and through whom he acquired title, in order to get a complete and absolute title from the government, as it is necessary to show that the land has been used, and in what manner, for a definite length of time, before the settler acquires his title from the government.

There are claims for labor and wages by mechanics for work done, by material-men for material furnished, or by pilots for pilotage. When filed of record these claims become liens against the property which has been benefited by the work, material, or care bestowed upon it.

Claims, when filed in the name of a municipal corporation for improvements, such as opening or widening a street, laying sewers, or any municipal improvement, are liens against the property benefited.

Claims, Court of. See COURTS.

Clairac, klā-rāk, France, a town in department Lot-et-Garonne, on the Lot. It was the first town in the south of France to declare in favor of the Reformation. Pop. 2,388.

Clairaut, klā-rō, **Alexis Claude**, klōd, French mathematician: b. Paris 13 May 1713; d. there 17 May 1765. In his 11th year he composed a treatise on the four curves of the third order, which, with his subsequent 'Researches on Curves of Double Curvature' (1731), procured him a seat in the Academy at the age of 18. He accompanied Maupertuis to Lapland, to assist in measuring an arc of the meridian, and obtained the materials for his work 'On the Shape of the Earth.' In 1752 he published his 'Theory of the Moon,' and in 1759 calculated the return of Halley's comet. A brother, who died at the age of 12, published in his ninth year a treatise entitled 'Divers Quadratures of Circular Elliptics.'

Clairin, George Jules Victor, zhōrzh zhül vĕk-tōr klā-rāñ, French portrait painter: b. Paris 11 Sept. 1843. He studied in Paris under Picot and Pils, and obtained a second class medal at the Paris Exposition in 1889, and the Legion of Honor medal in 1888. Beside portraits he has painted several brilliant scenes from Spanish history.

Clairvaux, klār-vō' (*clara vallis*, lightsome vale), a village of France on the river Aube, 10 miles southeast of Bar Sur-Aube, noted as the site of the celebrated abbey of Cistercian monks, founded in 1115 by Saint Bernard, who was

its abbot till his death in 1153. It was a vast establishment, comprising within its enclosure a large population both of monks professed, lay brothers, laborers and artisans employed in various industries. There was a large and magnificent church; four cloisters surrounded by buildings for housing the monks, *conversi* or lay brothers, the novices and the superannuated members of the order; the abbots' hall with the guest house adjoining it, the kitchen, refectory, infirmary, scriptorium, etc.; all these were grouped in one portion of the monastic domain. In another portion were the fish tanks, the wine press, slaughter house, barns and stables, saw-mill, grist-mill, oil-mill, tannery, tile works, etc., producing all necessary supplies for the use of the inmates. At the Revolution the monks were turned out, and the lands and buildings, except the church which was destroyed by fire, were occupied for public uses: the buildings are now used as a penitentiary and workhouse.

Clairville, Louis François, loo-ē frāñ-swä klār-vĕl, French writer of light comedy: b. Lyons 1811; d. 1879. He was the author of more than 220 comedies, farces, and comic-opera libretti. Among his most successful operettas are: 'Daphnis and Chloe' (1849); 'Mme. Angot's Daughter' (1873); among his vaudevilles: 'Property Is Robbery' (1848); 'Antoinette's Temptations' (1850); 'Cinderella' (1866).

Clairvoy'ance, defined as the power of perceiving without the use of the organ of vision or under conditions in which the organ of vision with its natural powers alone would be useless. It comprises the sight of things past, present, or future. Various methods of clairvoyance are recounted; by direct vision of things at a distance (opaque substances being no hindrance); by looking into a black surface; by looking into water, into a crystal, etc.; or by laying the object to be described on the forehead or chest of the clairvoyant; but clairvoyants now usually represent the cerebral region as the seat of illumination. From remote antiquity the possession of such powers by favored individuals has been believed. In the Old Testament (2 Kings vi. 15-17) is an account of the opening of the inner vision in the case of the servant of Elisha in answer to the prayer of the prophet.

Clairvoyant powers were claimed for the Pythia at Delphi. Apollonius of Tyana and Diodorus Siculus testify to the clairvoyance of the Indian sages. Macrobius gives an instance of clairvoyance on the part of the oracle of the Heliopolitan god when consulted by the Emperor Trajan. Tertullian speaks of a seeress who could prophesy and prescribe for the sick. Clairvoyance was known among the nations of antiquity, and is still generally accepted as an undoubted fact among Eastern nations. As instances of clairvoyants in later times may be mentioned Jacob Böhme (1575-1624) and Emanuel Swedenborg (1688-1772), the Swedish scientist and founder of the religious body called "The Church of the New Jerusalem."

The phenomena of clairvoyance have been carefully observed. The clairvoyant state seems to be intimately connected with the mesmeric, the somnambulistic, and the so-called "biological." Mesmeric somnambulism and clairvoyance were first brought to notice by Puysegur in 1784. The clairvoyant is usually in a state of trance, which may be induced by mesmeric

CLAM — CLAOSAURUS

passes. In this state he is sometimes conscious only of his mesmerizer; in others, his clairvoyance is unrestricted; but the clairvoyant may enter the trance state spontaneously, or he may even be in possession of his ordinary faculties, both of which characteristics are to be found in Zschokke, the German novelist. In "second-sight," as found in Denmark, parts of Germany, and especially in the Highlands of Scotland, the seer is not in a state of trance similar to that in other forms of clairvoyance. Some modern scientists claim that the discovery of the X-rays, by Röntgen, in 1895, has solved a number of the questions raised by clairvoyance.

Clam. While the vernacular name clam is indiscriminately applied to any large edible bivalve, it is generally given to the northern "long" or soft-shelled clam (*Mya arenaria*), in distinction from the round clam, hard-shell clam, or quahog (*Venus mercenaria*), which extends from Cape Cod southward, though occasionally found as far north as the Maine coast (Casco Bay) and the Gulf of St. Lawrence at Shediac.

The long or soft-shelled clam occurs throughout the north Atlantic coast from New York to Greenland, and on the British shores, and is everywhere on the American coast a valuable article of food. The so-called black "head" is the siphon, which is very extensible and divided by a fleshy partition into two passages, opening out by two orifices surrounded by a circle of delicate sensitive tentacles; into the lower opening passes the sea-water, carrying minute animals, young and old, and diatoms, around to the mouth, which is in the larger end of the body; through the other or upper opening of the siphon the excrementitious matter is expelled. The clam has a tongue-shaped "foot," by which it burrows into the mud or sand to a depth of several inches.

The clam may be of either sex, male or female; it is very prolific, extruding an inconceivable number of eggs into the sea, where they are fertilized. The young larvæ (veligers) swim at the surface, where they are borne in all directions, until in a few days, the shells becoming heavier, they sink to the bottom, and, resting on the seaweed or stones at the bottom, the "spat" become attached by a few byssus threads. Clams begin to spawn by the end of the first year of their life, and in Narragansett Bay are sexually mature and the eggs become ripe when the animal is only an inch long. The breeding season begins in May, reaches its height in June, ending in July. Of course clams cannot feed when the tide is out, hence they grow more slowly when living near high-tide line. When the young begin to burrow, and they dig very rapidly during the first two months of their life, when one quarter to one half inch in length, they are attacked by crabs, eels, and starfish (q.v.). In Rhode Island attempts at restocking clam beds and raising clams artificially have met with success and promise valuable results in clam-culture. Clams have been taken five and three quarters inches long, and weighing 15 ounces. Attempts have been made to plant the clam on the Pacific coast.

The round, or little-necked clam, or quahog, as it is called in New England, lives in the sand from Cape Cod to Texas, just below low-

water mark, and abounds at the mouth of estuaries. The shell is heart-shaped, the valves very thick and heavy. This bivalve is fished by means of long rakes and tongs, or is dredged like oysters. It has a very large "foot," and plows through the sand, but does not burrow deeply.

The beach, surf, or hen clam is *Spisula* (formerly *Macra*) *solidissima*. The large edible species of the southern coast is the painted clam (*Callista gigantea*). Several large Pacific coast bivalves are edible and known as clams, being species of *Taper*, *Laxidomus*, and *Glycimens*. Very unlike any edible clam is the "giant clam" (*Tridacna gigas*) of the coral reefs of the Pacific Ocean, whose shell often weighs upward of 400 pounds. Consult: Mead, '30-33d Annual Reports of the Commissioners of Inland Fisheries of Rhode Island.'

Clamecy, klä-më-së, France, a town in the department Nièvre, 38 miles northeast of Nevers, left bank Yonne, at the mouth of the Beuvron. It was formerly surrounded by enormous walls, and defended by a castle, which commanded the town and environs. One of its suburbs, situated on the opposite side of the Yonne, was the seat of a bishopric *in partibus*, known as the bishopric of Bethlehem, founded in 1180 for the bishop of that place, who had been expelled by the Saracens. Wood-rafts for the supply of Paris with fire-wood are made up here, and floated down the Yonne and Seine. The parish church, founded in 1497, is remarkable for its tower and for some fine sculptures. Clamecy carries on several industries, the chief being that of tanning. Pop. 4,800.

Clan, a tribe or number of families, bearing the same surname, claiming to be descended from the same ancestor and united under a chieftain representing that ancestor. The clan system is essentially the same as that existing among the Arabs, the Tartars, and tribes similarly situated. From ancient times the "clans" existed in Ireland. The system is said to have sprung up in Scotland about 1008, while Malcolm II. was reigning, but it may have been of greater antiquity. In 1747 the legal authority of the chiefs over their followers was abolished as a punishment for the part which the former had taken in the insurrection which ended in 1745 at Culloden. While the clans flourished they were divided into two, the clans of the borders and those of the highlands.

Clan-Na-Gael, klän-na-gäl, Irish secret society, founded in the United States for the purpose of aiding in securing "Home Rule" for Ireland. The society has been charged with some grave crimes, said to have been perpetrated for the purpose of intimidating the British government; but so little is really known about the workings of the organization, nothing positive can be asserted.

Claosaurus, klā-ō-sôr'us, **Trachadon**, trāk'-a-dōn, or **Trachodon**, a genus of duck-billed dinosaurs (see DINOSAURIA) of the Cretaceous Period. This dinosaur was bipedal, herbivorous, resembling the hadrosaurus (q.v.), but the bill was not so broad. Its remains are found in the Upper Cretaceous formations of North America. A mounted skeleton possessed by Yale University is 30 feet long and stands 14 feet high.

CLAP — CLARE

Clap, Roger, American pioneer: b. Salcomb, Devonshire, England, 6 April 1609; d. Boston, Mass., 2 Feb. 1691. He came to America in 1630, and with other colonists settled the present Dorchester, Mass. In the course of his life he held several military and civil offices, being captain of Castle William 1665-86, and representative in the general court 1652-6. His 'Memoirs,' written for the instruction and benefit of his children, were originally published by Rev. Thos. Prince (1731). Other editions are: 'Memoirs of Roger Clap; Relating Some of God's Remarkable Providences to Him in Bringing Him Into New England' (Boston 1807; Pittsfield 1824; and an edition with preface, etc., printed by the Dorchester Antiquarian and Historical Society, Boston 1844).

Clap, Thomas, American clergyman: b. Scituate, Mass., 26 June 1703; d. New Haven 7 Jan. 1767. He was settled as a minister at Windham, Conn., in 1727, and in 1739 was elected president of Yale College. He contributed much to improve that institution, and was the means of building a college edifice and chapel. He was a man of extensive erudition, gave great attention to mathematics and astronomy, and constructed the first orrery made in this country. He published a 'History of Yale College' (1766); 'Nature and Foundation of Moral Virtue and Obligation' (1765); 'Nature and Motion of Meteors' (1781); etc.; and had made collections for a history of Connecticut; but most of his manuscripts were plundered in the expedition against New Haven, under Gen. Tryon. He had a controversy with President Edwards respecting Whitefield, and opposed the latter, not so much upon religious grounds as from a misapprehension of Whitefield's designs.

Clapboard, klăp'bōrd, colloq. klăb'ōrd, a thin, narrow board commonly used for covering the sides of wooden buildings. Clapboards are usually of white pine, and are made much thinner on one edge than on the other, so that when nailed on to each other one can lap a little over the one next below it. This makes the covering of the building much tighter than if the boards were only set together one above the other, and keeps the rain from driving in. Clapboards are sawn out of solid logs, not by sawing them clear through, as in making common boards, but by sawing from the outside to the middle or heart of the log. They are thus made thicker on the outside than on the inside. They are afterward smoothed in a planing machine.

Clapham, klăp'am, a southwest suburb of London, lying a mile south of the Thames. Clapham Common is still an open common of 200 acres. Clapham Junction, in Battersea parish, is one of the busiest and most perplexing railway junctions in the world.

Clapham Sect, a name given by Sydney Smith to the Evangelical Party in the Church of England; the Rev. Henry Venn was the vicar of Clapham, and some of the most eminent Evangelicals — Zachary Macaulay, Wilberforce, and the Rev. W. Romaine — lived there. Thackeray's 'Newcomes' has made the phrase familiar to a later generation.

Clapnet, a ground net used by bird catchers, consisting of two equal parts about 12 yards long by 2½ wide, and each having a

slight frame. They are placed about four yards apart, and are pulled over by a string so as to enclose any birds on the intervening space.

Clapp, Henry Austin, American dramatic critic: b. Dorchester, Mass., 17 July 1841; d. there 19 Feb. 1904. He was for many years clerk of the supreme judicial court of Massachusetts, and a well-known dramatic critic on the Boston press. He also lectured extensively on Shakespeare. He published 'Reminiscences of a Dramatic Critic' (1902).

Clapperton, Hugh, Scottish explorer: b. Annan, Dumfriesshire, Scotland, 1788; d. near Soccato, central Africa, 13 April 1827. He entered the merchant service, but was impressed into the navy, in which he became a lieutenant in 1816. He then went to Africa, where he remained till 1825, returning with valuable information, though the disputed question of the course of the Niger was left undecided. On his return to England Clapperton received the rank of captain, and immediately engaged in a second expedition, to start from the Bight of Benin. Leaving Badagry in December 1825, he penetrated to Katunga, within 30 miles of the Quorra or Niger, but was not permitted to visit it. At Soccato the Sultan Bello refused to allow him to proceed to Bornu, and detained him a long time in his capital. He was the first European who traversed the whole of central Africa from the Bight of Benin to the Mediterranean. See Landor, 'Records of Captain Clapperton's Last Expedition' (1830).

Claque, klăk, a body of paid applauders at a public performance, according to tradition, an invention of Nero's. At the present time the claque is a recognized feature of theatrical management in Paris, and although said to be employed in London and New York, the use of such artifices is not recognized as legitimate outside of the French capital.

Clare, Saint, or **Saint Clara**, Italian nun: b. Assisi 11 July 1194; d. 12 Aug. 1253. When very young she was attracted by the accounts of the work being done by Saint Francis (q.v.), a young man of her native place. At an early age she decided to give her life wholly to God and to work for him in poverty. She sought and received the advice of Saint Francis, and when only 18 years of age, gave up the world, and began to devote herself wholly to charity. Other pious young women soon joined her and in time a recognized religious order was founded. For some years they had no special rule, but in 1218 they adopted the rule of Saint Benedict. Later (1224) Saint Francis gave them a rule, mitigating the rigors of the fast, but recognizing holy poverty in the extreme. Two years after her death she was canonized by Alexander IV. The order which she founded is known throughout the world as "Poor Clares"; but several branches of the order have been established as "Order of Saint Clara," "Capuchin Poor Clares," and the name by which first known, "Order of Poor Ladies." Another and a correct title is "Second Order of Saint Francis." The differences in the branches are the rules of poverty. Saint Clare allowed none of her nuns nor herself to hold property individually nor as a body. She followed the practice of Jesus Christ. They did not own the houses in which they lived. Some of the branches, as a body, have corporate rights of

CLARE — CLARENCE

property. Saint Clare is known by the name, "Princess of Poverty."

Clare, Saint, Order of. See CLARE, SAINT.

Clare, Israel Smith, American historical writer: b. Lancaster County, Pa., 24 Nov. 1847. He has published: 'Illustrated Universal History' (1876); 'Complete Historical Compendium' (1884); 'Library of Universal History' (1890); 'History of British Boer War' (1900).

Clare, John, English peasant poet: b. Helpstone, Northamptonshire, 13 July 1793; d. Northampton 20 May 1864. He led a rambling, unsteady life until 1818, when he was obliged to accept parish relief. In 1821 his 'Poems Descriptive of Rural Life and Scenery,' met with a favorable reception, and the issue of his 'Village Minstrel' later in the same year won him many friends. A subscription furnishing him with £45 annually was, however, dissipated by 1823, and his 'Shepherd's Calendar' (1827), which he hawked himself, was not a success. He brought out a new work, the 'Rural Muse,' in 1835, but became insane shortly afterward, and the remainder of his life, from 1837 to 1864, was passed in the Northampton Lunatic Asylum. Clare was a genuine poet, and his pictures of rural life are eminently truthful and pleasing.

Clare, Ireland, a county in the province of Munster; boundaries north and east, Galway Bay and county; east and south, the Shannon separating it from Tipperary, Limerick, and Kerry; west, the Atlantic. Area, 827,994 acres, nearly three fourths of which is under cultivation or in use as pasturage, and the remaining portion is in bog, mountain, or under water. The surface is irregular, rising in many places into mountains of considerable elevation, particularly in the east and west and northwest districts. The grazing lands are excellent; the chief minerals are limestone, lead, and slate, and in the southwest coal; but owing to the laws regarding mining, the mineral deposits remain almost undeveloped. The chief crops are oats and potatoes. Sheep and cattle on the hillsides, salmon in Clonderlaw Bay, the rivers Shannon and Fergus and at Dunbeg are sources of income. There are oyster beds near Ballyvaughan and along the shores of Burren. Frieze and hosiery are manufactured. The chief town is Ennis. Pop. (1901) 112,100.

Clare College, University of Cambridge, founded in 1326, and first called "University Hall." In 1336 its patronage was given, by Richard de Baden, then chancellor of the university, to Elizabeth de Burgh, sister of the Earl of Clare. Her object in giving of her riches to this college was to educate young men who would become priests, in order to replace the many clergymen who died from the plague. The college has not continued to educate men for the purpose intended by its first patron. Many noted men have been educated in this school. At first there were a master, eight senior, and seven junior fellows, besides scholars and students. Now the 15 fellowships are open to B.A.'s or persons of a higher degree, without restriction as to marriage. A fellowship becomes vacant in five years and 11 months from the time of election, unless the holder occupies at the same time the post of professor, public

crator, etc., in the university, or the post of tutor, dean, bursar, or lecturer in the college. The master and fellows elect to the vacant fellowships, and the master is elected by the fellows. The foundation scholarships are eight of not less than £60, eight of not less than £40, eight of £20, four of £50 per annum each; three of about £60 per annum, tenable for three years, with preference to clergymen's sons; with several minor scholarships. At present there are 18 fellows, 24 residents, and two non-resident scholars, and several undergraduates.

Claremont, Cal., village in Los Angeles County, on the Atchison, T. & S. Fé R.R., 38 miles east of Los Angeles. This is the centre of a large fruit growing and raisin making region, and large crops of oranges and lemons are raised here. It is the seat of Pomona College, a Congregational institution, founded in 1888. Pop. (1902) 1,200.

Claremont, N. H., town in Sullivan County, on the Boston & Maine Railroad, 50 miles north of Concord. The cotton- and woolen-mills obtain their power from the Sugar River. There are also paper-mills, shoe factories, and lumber, granite, brick, and marble yards. There are two national banks with a combined capital of \$200,000; Stevens High School, and the Fiske Free Library, founded in 1873 and containing 8,000 volumes, are located there, and the town has six churches. The town was first settled in 1767, the predominating nationality in the population now being French Canadian. Pop. (1900) 5,498.

GEORGE I. PUTNAM,
Editor 'Advocate.'

Clarence, George, DUKE OF, English prince: d. London 18 Feb. 1478. He is chiefly celebrated for his tragical end, and for the use made of his name and history by Shakespeare. He was the son of Richard, Duke of York, and brother of Edward IV., king of England, and on his brother's accession to the crown in 1461 he was, as the reward of his assistance, created Duke of Clarence, and in 1462, lord-lieutenant of Ireland. When the Earl of Warwick deserted the cause of Edward, Clarence entered into alliance with him, married his daughter in 1469, retired with him to France, and afterward landed with him at Dartmouth in September 1470, and in a parliament held at Westminster by the Lancastrians had the crown settled on him, failing the issue of Henry VI. Clarence had already meditated a double treachery before leaving France, and at Coventry, on 30 March 1471, he left the party he had espoused on the field of an imminent battle, and joined his brother Edward. Clarence's wife having died in 1476, he offered himself, on the death of Charles the Bold, to Mary, heiress of the estates of Burgundy, but the king opposed his suit, which hardly needed his opposition to cause it to miscarry. Some of his servants were about the same time hurriedly put to death on an accusation of magic. Clarence appeared in the council to complain of the injustice of their sentence. For this interference with justice he was committed to the Tower. A parliament was summoned, which condemned him to death; and on 18 Feb. 1478 he was found dead in the Tower.

CLARENCE — CLARENDON

Clarence, Duke of, a title sometimes bestowed upon a younger member of the royal family of Great Britain. The title is variously derived from Clare or Clarence (Lat. *Clarentia*) in Suffolk, from Clarenza, in the Morea, over which an English knight ruled during the Crusades, etc. The title was first given to Lionel, son of Edward III. It was last conferred upon Albert Victor (b. 8 Jan. 1864; d. 14 Jan. 1892), eldest son of King Edward VII.

Clarence Harbor, a bay on the west coast of Alaska, about 50 miles southeast of Cape Prince of Wales. An Eskimo village, Port Clarence, has long been situated on the northeast shore. Here in May 1892 Dr. Sheldon Jackson, the commissioner of education for Alaska, established the Teller Reindeer Station, as an industrial school for instructing the natives in the management and propagation of the domestic reindeer. With the aid of a government appropriation deer were brought from eastern Siberia, and in 1893 a colony of Lapps was settled here to give the necessary instruction. The natives have taken readily to the new occupation, the herd has been augmented by further importation and by natural increase, other stations have been established, and these far northern citizens, formerly in a half-starved condition from the invasion of their hunting-grounds, given a new industry and a new source of food and clothing.

Clarence Island, (1) An island south of South America and west of Tierra del Fuego; lat. 54° 10' S.; lon. 71° 20' W. (2) An island in the Pacific Ocean, north of Navigator Island; lat. 8° 10' S.; lon. 172° 10' W.

Clarence River, a large river of Australia, rising in the McPherson Mountains and flowing eastward for about 250 miles through a fertile valley into Shoal Bay, New South Wales. It is navigable for 50 miles, to Grafton for vessels of 10 feet draught, and small steamers ply to Moleville, 30 miles farther up.

Clarence Strait, (1) In the Persian Gulf, between the island of Kishm and the mainland. It is from 3 to 13 miles broad and has many islands. (2) In Alaska, between the Prince of Wales Archipelago and Duke of York Island. (3) In Australia, the channel between Melville Island and the northwest coast, communicating with Van Diemen's Gulf.

Clarencieux, or **Clarenceux**, klar'ën-shōō, an officer of the English heraldic college. The jurisdiction of this king of arms includes England south of the Trent; that of Norroy, the second king of arms, the territory north of that river. The duties of the office include the granting and survey of arms, the registry of descent and marriages, etc.

Clar'endon, Edward Hyde, EARL OF, English statesman: b. Dinton, Wiltshire, 18 Feb. 1608; d. Rouen, France, 9 Dec. 1674. He commenced his political career in 1640, when he was returned to Parliament. In this Parliament he argued in favor of a grant to the king, which was successfully opposed by Hampden. He was returned to the Long Parliament (November 1640) by the borough of Saltash, and laid aside his legal business to devote himself to his parliamentary duties. At first he acted with the

more moderate of the popular party, but soon found reason to change his course. A dread of democracy seems first to have led him to oppose his former friends, but his speeches and votes soon attracted the notice of the court, into the favor of which he passed. He was offered the solicitor-generalship, which he declined, but agreed, at the king's request, to consult with his regular advisers, Falkland and Colepepper. Hyde was an honest and independent supporter of the royal authority, disposed to make moderate concessions to the popular demands, and in no way responsible for the rash measures of the king, which were often taken without consulting any of his advisers. Upon the breaking out of the civil war he attached himself to the king's party, became chancellor of the exchequer and member of the privy-council; and after vainly attempting to bring about a reconciliation between the contending parties, was appointed by the king to wait upon the Prince of Wales, who was first sent with an army to the west. Afterward, on the continued ill success of the royal party, he retired to Jersey. Here he remained for two years, while the prince was in France, and during that time began his 'History of the Rebellion.' He likewise composed at Jersey the various writings which appeared in the king's name as answers to the manifestoes of the Parliament. On the capture of the king, Hyde received orders to rejoin the Prince of Wales, but was becalmed and taken prisoner by pirates from Ostend. In September 1649 he rejoined Charles at The Hague, who sent him to Madrid to see if any assistance could be obtained from the Spanish court. On the failure of this negotiation he retired to Antwerp, but soon resumed the business of the exiled court, of which he continued to be the most trusted adviser, first at Paris, and afterward at The Hague, where Charles II. appointed him lord-chancellor of England in 1657. After Cromwell's death Edward Hyde contributed more than any other man to the success of the measures which placed Charles II. on the throne. He subsequently possessed the entire confidence of the king, who loaded him with favors. In 1661 he was made peer, and Baron Hyde, Viscount Cornbury, and Earl of Clarendon. Many events occurred to disquiet him in the licentious court of Charles II.; among these was the marriage of the Duke of York, the king's brother, to his daughter. The Duke, while at Breda, the residence of his sister, the Princess of Orange, became acquainted with Anne Hyde, Clarendon's eldest daughter, maid of honor to the princess, and married her secretly 3 Sept. 1660 to legitimize their first child, born on 22 October. Anne was acknowledged as Duchess of York in December 1660, and two daughters, Anne and Mary, were the fruit of this marriage, both of whom ascended the British throne. In 1663 Lord Bristol made an attempt to impeach the chancellor in Parliament, which, though some of the acts of Clarendon's administration were questionable, proved unsuccessful. The Duke of Buckingham, moreover, was continually laboring to make the chancellor ridiculous in the eyes of the king, and his station as prime minister made the nation regard him as answerable for all the faults of the administration. The ill success of the war against Holland, the

CLARENDON

sale of Dunkirk, and other events, excited public indignation. The king's displeasure was changed into hatred when he saw his plan of repudiating his wife and marrying Lady Stuart defeated by Clarendon, who effected a marriage between this lady and the Duke of Richmond. The king deprived him of his offices, and an impeachment for high treason was commenced against him. The lords refused to imprison him on a general accusation by the Commons. This gave rise to a dispute between the two houses, to end which Clarendon retired to Calais, leaving an exculpatory letter to the lords, which they communicated to the Commons, who ordered it to be burned by the common hangman. The lords still refused to join in his attainder, but agreed with the Commons in an act of banishment and incapacity. The hatred of the nation pursued him even to the Continent. At Evreux he was attacked by some British sailors, dangerously wounded, and with difficulty rescued from their hands. He lived six years at Montpellier, Moulins, and Rouen, at which latter place he died. His remains were afterward carried to England, and buried in Westminster Abbey. Lord Clarendon, as long as he was minister, was the friend and supporter of the king against the factious, and the defender of his country's freedom against the abuse of the royal power. Ingratitude and prejudice the more easily ruined him, as his stern and proud character prevented his gaining friends. Among his many writings, the most important is the 'History of the Rebellion, from 1641 Down to the Restoration of Charles II.' It is a very able work, although not free from prejudices. Consult Lister, 'Life of Lord Clarendon' (1838).

Clarendon, George William Frederick Villiers, 4TH EARL OF, English statesman: b. 12 Jan. 1800; d. 27 June 1870. By his mother Lord Clarendon was indirectly related to the Hydes, the family of the great Earl of Clarendon, author of the 'History of the Rebellion.' He was educated at Cambridge, entered the civil service at an early age, and in 1833 was appointed minister-plenipotentiary to the court of Madrid. He was instrumental in negotiating a treaty, signed in 1834, called the Quadruple Alliance, in which the four contracting parties—England, France, Spain, and Portugal—agreed to unite in expelling Don Carlos and Don Miguel, pretenders to the Spanish and Portuguese crowns, from the peninsula, and was subsequently much consulted by the Spanish government.

In 1839 Lord Clarendon, having succeeded during the previous year to his uncle's title, returned home to take his seat in the House of Lords. In January 1840 he was appointed lord privy-seal; and was lord-lieutenant of Ireland from May 1847 to February 1852. The most notable events of the period were the great Irish famine, and the rebellion headed by Smith O'Brien, M.P., which ended in the defeat of the rebels by the police, after months of threatening and systematic publication of sedition in the newspapers which espoused their cause. Lord Clarendon's administration in regard to both of these difficulties has been deemed by dispassionate observers both firm and philanthropic; but his early popularity somewhat declined in Ireland, which was perhaps due to his impartiality in declining to favor the zealots either of the

Roman Catholic or the Orange party. He became secretary of foreign affairs in 1853, retaining office until 1858. During this period the Russian war was brought to a successful termination, and Lord Clarendon, in conjunction with Lord Cowley, the British ambassador at Paris, conducted the peace negotiations at Paris as joint-plenipotentiary of Great Britain, and signed the Treaty of Paris 30 March.

In 1861 Lord Clarendon was sent as ambassador-extraordinary to the coronation of the king of Prussia; in 1868 was sent on a special mission to the Pope and the king of Italy. In the ministry of Mr. Gladstone, which succeeded Mr. Disraeli's, Lord Clarendon again occupied the post of foreign secretary, and continued in office till his death.

For the office of foreign secretary, which he held so long, Lord Clarendon was generally admitted to possess high qualifications; but it was complained, even by his admirers, that he adhered too long to the tradition of secrecy attaching to the foreign office. As a statesman he was remarkable rather for a liberality and large-heartedness, which gave a conciliatory tone to his negotiations with foreign powers, and for the undeviating rectitude of his conduct, than for any commanding qualities of intellect.

Clarendon, Ark., town, county-seat of Monroe County, situated on the White River, on the St. Louis & S., and the Arkansas M. R.R.'s, 58 miles southeast of Little Rock. It is a trade centre for lumber and agricultural products. The manufacturing of wagons, staves, and other articles of wood supplies the local demands. Pop. 2,000.

Clarendon, England, a lodge in Wiltshire, near Salisbury. It is noted chiefly for being the place where were written, in 1164, the 'Constitutions of Clarendon,' defining the limits between the jurisdiction of the civil and ecclesiastical courts. Henry II. called together the bishops and barons of his kingdom, and they held council at Clarendon.

Clarendon, Vt., a town in Rutland County, on the Rutland R.R., noted for its medicinal springs, the waters of which are of value in the treatment of kidney, liver, and skin diseases. Its industries are fruit-raising, dairying, and maple-sugar making. Pop. (1900) 911.

Clarendon, Colony of. This title represents a repeated effort to found the settlement near the mouth of Cape Fear River, N. C., later flourishing as Wilmington. If successful from the outset, it would have been a counterpart of Albemarle (N. C.), and Ashley River (S. C.), and very likely given us a State of Middle Carolina under some name. The first colony was of New Englanders, in 1660: they had trouble with the Indians and abandoned the place by 1663, leaving a post with a placard on it highly disparaging to the region. Early in October 1653, however, the river was explored for 150 miles by Sir John Yeamans, a Cavalier adventurer from Barbadoes. He was delighted with the country, cared nothing for other people's opinions of it, and asked the lords proprietors of Carolina for a grant. They gave it, made him governor of it, and in May 1665 he returned with several hundred settlers from Barbadoes. But Yeamans had wider interests, and could not stay with the colony—from 1672 to 1674 he was governor of Carolina; trade was insufficient

CLARENDON — CLARETIE

for more than the northernmost and southernmost settlements; and Clarendon (so named from the famous Lord Clarendon, one of the proprietors) was gradually abandoned, ending with 1690.

Clarendon, Constitutions of, a code of laws adopted in the 10th year of Henry II. (1164), at a council of prelates and barons held at the village of Clarendon, in Wiltshire, in January of that year. These laws, finally digested into 16 articles, were brought forward by the king as "the ancient customs of the realm," and were enacted as such by the council. They consisted, however, partly at least, of reforms introduced by the king himself. Ten of the articles were condemned, and six allowed by Pope Alexander III. The six articles approved of were of comparatively slight importance, mostly confirming the privileges of the ecclesiastical order; among the condemned articles the most important were the first, providing that disputes between laymen and ecclesiastics as to advowsons should be tried in the king's court; third, that ecclesiastics accused of any offense against justice should be answerable to the civil courts for the civil offense, and to the ecclesiastical courts for the ecclesiastical offense; fourth, that ecclesiastical dignitaries should not go out of the kingdom without the king's leave; eighth, that appeals should be made from the court of the archbishop to the king's court, and should not go further (that is, to the Pope) without the king's consent; ninth, that in the event of a dispute between a layman and an ecclesiastic as to whether the civil or ecclesiastical court should have jurisdiction in certain cases of tenure of property, the tribunal should be determined by the king's chief justice upon a recognition of 12 lawful men; 12th, that pleas of debt should belong to the king's jurisdiction. Notwithstanding the entreaties of the other prelates, and in defiance of the king, Becket, after a momentary appearance of yielding, peremptorily refused his signature to the articles. After the murder of the archbishop, the king, on his reconciliation with the Pope in 1172, was compelled to promise the abolition of all laws and customs hostile to the clergy; and at the Council of Northampton in 1176 the constitutions of Clarendon were materially modified in favor of the ecclesiastical order.

Clarendon Press, Oxford, the name by which the press of the University of Oxford is distinguished. In January 1586 delegates *de impressione librorum* were appointed by the Convocation of the University. About this time Joseph Barnes was styled "Printer to the University," and others bore the title after him. In 1633 Archbishop Laud procured letters patent granting a large license in printing to the university, with a view to the publication of manuscripts from the Bodleian Library. The work was carried on from 1713 to 1830 in the building known as the Clarendon, the cost of which was defrayed partly from the sale of Lord Chancellor Clarendon's 'History of the Rebellion,' the copyright of which was given to the university. The management of the printing-office is committed to a board consisting of the vice-chancellor and 10 other members of Convocation, nominated by the vice-chancellor and proctors, as vacancies occur. Five are perpetual delegates, and five are nominated for a term of

seven years. The south side of the present building (the additional accommodation required and opened) is appropriated to the printing of Bibles and prayer-books. The north, called the "learned" or "classical" side is assigned for the printing of university documents, books printed by authority of the delegates, and those sent in by private authors and publishers. Those printed for the university itself (but no others) bear on the imprint "E Typographeo Clarendoniano," or "At the Clarendon Press." Some admirable specimens of typography have been produced by the Clarendon Press.

Clarens, klä-rän, Switzerland, in the canton of Vaud, on the northeastern coast of Lake Geneva, about 50 miles from Geneva. The healthfulness of the climate, and the beauty of the place make it a resort for invalids. It is the scene of Rousseau's 'Nouvelle Héloïse.'

Clares, Poor. See CLARE, SAINT; ORDERS, RELIGIOUS.

Claret, a name originally given to wines of a light-red color, but now applied to the red wines imported from France, chiefly from Bordeaux. These wines vary in composition according to the locality, season, and age, but the produce of each vineyard usually retains its own peculiar characteristics. The most esteemed are those produced at the vineyards of Lafitte, Latour, Chateau Margaux, and others. Many of the clarets formerly sold in the United States were nothing more than the *vin ordinaire* used by the French peasants and working classes, but since the development of the California grape industry as good domestic claret can be obtained here as anywhere. A genuine claret should contain from 10 to 12 per cent of proof spirit.

Fictitious clarets were sometimes prepared by mixing a rough cider with a cheap French wine, and coloring with cochineal, logwood, elderberry, hollyhock, indigo, litmus, red cabbage, beet-root, or ros-aniline. To detect these coloring matters the following method may be adopted: Make a jelly by dissolving five grams of gelatine in 100 cubic centimeters of warm water, and pour it into a square flat mold. From this cake of jelly cubes about three fourths of an inch square are cut with a sharp, wet knife, and are immersed in the wine; they are taken out after 24 to 48 hours, washed slightly, and sections cut in order to see how far the coloring matter has penetrated. If the wine is pure, the color will be confined to the edges of the slice, or will not have penetrated more than an eighth of an inch. The coloring matters mentioned above permeate rapidly, and color the jelly.

Claretie, Arsène Arnaud, är-sän är-nō klär tē, called **Jules**, zhül, French novelist and dramatist: b. Limoges 3 Dec. 1840. He has written a long series of very successful novels, the most noteworthy of them being: 'Madeleine Bertin' (1868); 'The Million' (1882); 'Monsieur the Minister' (1882); 'Noris, Manners of the Time' (1883); 'The American Woman' (1892). He wrote also some striking chapters of contemporary history, as 'The Revolution of 1870-1'; 'Paris Besieged'; 'Five Years After: Alsace and Lorraine Since Annexation.' His dramatic compositions relate mostly to the time of the great Revolution. He

CLARIBEL — CLARK

became administrator of the Comédie Française in 1885, and was chosen member of the Academy in 1888.

Clar'ibel. (1) The bride of Phaon, as told in Spenser's 'Faerie Queene.' Philemon endeavors to injure her by false stories to which Phaon gives credit and kills Claribel. When he learns the deception he murders Philemon. (2) A poem by Tennyson.

Claribel, Sir, a knight who figures in Spenser's 'Faerie Queene.' One of four knights who fight for the false Florimel. Bretomart enters the combat with them; Arthur ends the fray, or it is "stinted" by him.

Clarification, the separation of the insoluble particles that prevent a liquid from being transparent. It may be performed by depuration, filtration, or coagulation. In the first of these operations the liquid is permitted to subside, without being in the least disturbed, until all the particles which were in suspension are precipitated; it is then decanted. This mode of clarification can be used only when the substance operated on is in a large quantity, or is of a nature not to be altered during the time necessary to complete the operation, and when its specific gravity is less than that of the particles which render it turbid. Filtration is a process by which a liquid is strained through a body, the interstices of which are small enough to stop the solid particles contained in it. Filters of wool, linen, paper, powdered glass, sand, or charcoal, may be used, according as the liquid is more or less dense, or of a nature to operate upon any one of these bodies. Clarification by coagulation is performed with the assistance of albumen (as isinglass or white of eggs) added to the liquor for this purpose, which, by the action of heat, of acids, etc., becomes solid, forms a mass, and precipitates the extraneous substances. Clarification is also now commonly effected by centrifugal machines.

Clarinda, Iowa, city, county-seat of Page County; situated on the Nodaway River, and the Chicago, B. & Q. R.R.; and is 45 miles east of the Missouri River. It is surrounded by an agricultural and stock-raising country, and contains carriage factories, brick works, flour-mills, iron works, and two banks. Valuable coal beds are near the city; also a State asylum for the insane. Pop. (1900) 3,500.

Clarinet, or Clarionet, a wind-instrument of the reed kind, with a trumpet-formed mouth, and played by holes and keys. Its scale, though including every semitone within its extremes, is virtually defective. Its lowest note is E below the F clef, from which it is capable, in the hands of good performers, of ascending more than three octaves. Its powers through this compass are not everywhere equal; the player, therefore, has not a free choice in his keys, being generally confined to those of C and F, which indeed are the only keys in which the clarinet is heard to advantage. The music for this instrument is therefore usually written in those keys. There are, however, B flat clarinets, A clarinets, D clarinets, B clarinets, and G clarinets; the three latter are not ordinarily used.

Clarion, a musical instrument of the trumpet kind, with a narrower tube and a higher and shriller tone than the common trumpet.

Clarissa Furiosa, a story by W. E. Norris, first published in 1896. It may be regarded in the light of a satire on the "New Woman," and is perhaps the least successful of the clever author's novels. The most of the story is taken up with the semi-public life to which the heroine devotes herself after she has separated from her husband. The workmanship is good, but the writer's want of genuine interest in his characters is felt.

Clarissa Harlowe, a novel by Samuel Richardson, published in 1751. It is a story of a noble-minded young woman, whose good reputation is compromised by her lover, Lovelace. The scene is laid in rural England of the first half of the 18th century. The story is largely told by letters exchanged between Clarissa and her confidante Miss Howe, and between Lovelace and his friend Belford. To the present-day reader, the tale seems slow and prolix; but it is a truthful picture of the conventions and ideals of its period, while it possesses a perennial life because it deals with some of the elemental interests and passions.

Clark, Abraham, American patriot: b. Elizabethtown, N. J., 15 Feb. 1726; d. Rahway, N. J., 15 Sept. 1794. He studied for the bar and practised in his native State with success. After serving as sheriff of Essex County, he was chosen a delegate to the Continental Congress in 1776 and signed the Declaration of Independence. He was a member of the Constitutional Convention of 1789, and aided in framing the Constitution of the United States.

Clark, Alexander, American clergyman and writer: b. Jefferson County, Ohio, 10 March 1834; d. Georgia 6 July 1879. He was editor of the 'Methodist Recorder' (1870-9). He wrote: 'The Old Log Schoolhouse' (1864); 'Workaday Christianity' (1870); 'Rambles in Europe' (1877); 'Ripples on the River,' verse.

Clark, Alonzo, American physician: b. Vermont 1 March 1807; d. New York 1887. He graduated at Williams College 1828, and at the College of Physicians and Surgeons, New York, 1835, entering at once upon the practice of his profession, of which he became an eminent member. He was professor of the theory and practice of medicine in the University of Vermont, of anatomy and pathology in the University of the City of New York, of pathology and practical medicine in Columbia University 1860-87, and dean of its medical faculty 1875-84. He was also president of the College of Physicians and Surgeons, and filled various offices in the societies and associations of which he was a member. Besides many contributions to medical periodicals, he published 'Presidential Address Before the New York State Medical Society' (1853); 'Lectures on Diseases of the Heart' (1884).

Clark, Alonzo Howard, American scientist: b. Boston 13 April 1850. He left his studies at Wesleyan University to enter the service of the United States Fish Commission, making a thorough study of the work. He has written: 'History of Fishery Industries of the United States'; 'Whales and Sea Fisheries'; 'History of the Mackerel Fisheries'; 'Food Industries of

CLARK

the World.' Since 1881 he has been connected with the Smithsonian Institution.

Clark, Alvan, American astronomical-instrument maker: b. Ashfield, Mass., 8 March 1808; d. Cambridge, Mass., 19 Aug. 1887. He was at one time a portrait painter in Boston; but in 1844 his attention was turned to telescope making. Two years later he definitely adopted the business of astronomical-instrument making, and in time achieved a world-wide reputation. His famous telescopes include the Chicago 18½-inch, the Washington 26-inch, the Russian 30-inch, and the California 36-inch.

Clark, Alvan Graham, American astronomer: b. Fall River, Mass., 10 July 1832; d. Cambridge, Mass., 9 June 1897. He was a son of Alvan Clark (q.v.), and became associated with him under the firm name of Alvan Clark & Sons. In 1859 they began work on an object glass with an aperture of 18½ inches, which ultimately became the property of the Astronomical Society of Chicago. With this instrument Clark discovered the companion of Sirius, for which the French Academy awarded him the Lalande medal. Other telescopes constructed largely under his supervision were: that for the Naval Observatory, a 26-inch instrument with which Prof. Asaph Hall discovered the two satellites of Mars; the McCormick telescope for the University of Virginia; the great 30-inch one for the St. Petersburg Imperial Observatory; the powerful Lick telescope, with an aperture of 36 inches, at Mount Hamilton, Cal. (1886), with which Jupiter's fifth satellite was discovered; and finally, the greatest of his achievements as a maker, the wonderful Yerkes lens of 40 inches, the gift of C. T. Yerkes to the University of Chicago, and installed in the observatory at Lake Geneva, Wis. As an astronomer he made several discoveries of double stars.

Clark, Sir Andrew, Scotch physician: b. Aberdeen 28 Oct. 1826; d. London 6 Nov. 1893. He was educated at Aberdeen and Edinburgh. After an unusually brilliant career as a student of medicine at Edinburgh, he assisted Dr. Hughes Bennett and Dr. Robert Knox, the anatomist, and next had charge for four years of the pathological department at the Haslar Naval Hospital. After graduating at Aberdeen in 1854, he settled in London. He will live in remembrance as the "beloved physician" of George Eliot.

Clark, Anson Luman, American eclectic physician and surgeon; b. Clarksburg, Mass. 12 Oct. 1836. In 1858 he graduated as B.A. in Lombard University, and as A.M. in 1868 in medicine, at the Eclectic Medical Institute of Cincinnati, Ohio, in 1861. He served during the Civil War as assistant surgeon, and was a member of the House of Representatives of the 27th General Assembly of Illinois. Since 1868 he has filled the chair of Diseases of Women and Obstetrics in the Bennett Medical College of Chicago, Ill. He wrote 'Clark's Diseases of Women' (1878).

Clark, Champ, American politician: b. Anderson County, Ky., 7 March 1850. He was graduated at Bethany College and Cincinnati Law School, and in 1873-4, was president of Marshall College, W. Va. He has attained dis-

tingtion as a Democratic campaign speaker, and since 1893 has been, with an intermission of one term, a member of Congress from Missouri.

Clark, Charles Dickson, American jurist: b. Laurel Cove, Tenn., 7 Oct. 1847. He was graduated at Cumberland University in 1875, and practised as a lawyer in his native State until 1895, when he was appointed judge of the United States court for the eastern and middle districts of Tennessee.

Clark, Charles Edgar, American naval officer: b. Bradford, Vt., 10 Aug. 1843. He entered the naval service in 1860; took part in the battle of Mobile Bay and in the bombardment of Fort Morgan; and was promoted captain in 1896. In March 1898 he took command of the battleship Oregon at the Mare Island navy yard, San Francisco, and when war with Spain was deemed inevitable, received orders to proceed to Key West, Fla., with all haste. After a voyage of over 14,000 miles, he joined the American fleet in Cuban waters on 26 May, and on 3 July commanded his ship at the battle of Santiago. In March 1899 he was assigned to duty at the League Island navy yard; was promoted rear-admiral 16 June 1902, and retired 9 Aug. 1905.

Clark, Charles Heber ("MAX ADELER"), American journalist: b. Berlin, Md., 11 July 1841. He is the editor of the 'Textile Record' in Philadelphia, and has written much on economic themes, but is best known to the general public as a humorist under the pseudonym MAX ADELER. He has published: 'Out of the Hurly Burly'; 'Elbow Room'; 'The Fortunate Island'; 'Capt. Bluit' (1902).

Clark, Daniel, Canadian pathologist: b. Granton, Scotland, 29 Aug. 1836. He went to Canada when a child; was graduated at Victoria University in 1858; and practised medicine in Ontario with great success. He has paid especial attention to mental diseases and the care of the insane. Since 1875 he has been at the head of the Provincial Asylum for the Insane at Toronto, and was later made professor of psychology and mental diseases in Toronto University. He was also twice elected president of the College of Physicians and Surgeons of Ontario. He has written 'Pen Photographs' (1873); 'Josiah Garth,' a novel.

Clark, Edson Lyman, American Congregational clergyman: b. Easthampton, Mass., 1 April 1827. He was graduated from Yale in 1853, and from Union Theological Seminary in 1858, and has filled several Congregational pastorates in New England. He has published: 'The Arabs and the Turks'; 'The Races of European Turkey'; 'Fundamental Questions, Chiefly Relating to the Early Hebrew Scriptures.'

Clark, Edward, American architect: b. Philadelphia 1822; d. Washington, D. C., 6 Jan. 1902. He studied architecture under Thomas W. Walter, and after serving as assistant, was made chief architect of the United States capitol in 1864, serving continuously till his death. He was a member of the leading architectural commissions of the national government, including that for the completion of the Washington monument.

Clark, Edwin Charles, English jurist: b. Yorkshire, England, 5 Nov. 1835. He was educated at Shrewsbury School and Trinity College, Cambridge, where he became scholar and Fellow.

CLARK

He practised for a short time as a conveyancer in London, being called to the bar at Lincoln's Inn 1860. In 1873 he was appointed regius professor of civil law at Cambridge, where he is also a professional fellow of St. John's College. His books are: 'Early Roman Law: Regal Period' (1872); 'Analysis of Criminal Liability' (1880); 'Practical Jurisprudence: a Comment on Austin' (1883); 'Cambridge Legal Studies' (1888).

Clark, Francis Edward, American clergyman: b. Aylmer, Quebec, 12 Sept. 1851. He was graduated from Dartmouth College in 1873, and continued his studies at Andover Theological Seminary. He became pastor of a Congregational church at Portland, Maine, and there organized the first Young People's Society of Christian Endeavor 2 Feb. 1881. He was pastor of the Phillips Congregational Church in South Boston, Mass., 1883-7, and in 1887 was made president of the United Society of Christian Endeavor and also became editor of the 'Golden Rule,' the official organ of the society.

Clark, Frederick Thickstun, American novelist: b. Pennsylvania 1858. He has published: 'A Mexican Girl'; 'In the Valley of Havilah'; 'On Cloud Mountain'; 'The Mistress of the Ranch.'

Clark, George Hunt, American poet: b. Northampton, Mass., 1809; d. Hartford, Conn., 20 Aug. 1881. He was a frequent contributor to 'Putnam's,' 'Knickerbocker,' and other journals. His published poems include 'Now and Then'; 'The News'; and a collection of humorous and sentimental pieces, entitled 'Undertow of a Trade-Wind Surf.'

Clark, George Rogers, American pioneer: b. Monticello, Va., 19 Nov. 1752; d. near Louisville, Ky., 18 Feb. 1818. He studied surveying, and at 20 settled in Ohio, serving in the Indian wars of that time and region. He removed to Kentucky in 1775, procuring the organization of that Territory. On the outbreak of the Revolutionary War he led the patriot army on the frontier, campaigning vigorously against the British throughout Illinois, Ohio, and Kentucky. His success in this saved much territory to the colonies in the final treaty of peace with Great Britain. He subsequently supported the cause of the French of the Mississippi valley against the Spaniards. He fell into penury in his latter years, and died in neglect. See CLARK, WILLIAM (1770-1838).

Clark, Henry James, American naturalist and prose-writer: b. Easton, Mass., 22 June 1826; d. Amherst, Mass., 1 July 1873. He was associated in work with Agassiz for several years; and was professor in several leading colleges and universities. Among his many contributions to literature are 'Mind in Nature, or the Origin of Life' (1863); 'Mode of Development of Animals' (1865); 'Claims for Scientific Property.'

Clark, Imogen, American novelist: b. New York. She has published: 'Will Shakespeare's Little Lad' (1897); 'The Victory of Ezry Gardner' (1897); 'The Heresy of Parson Medlicott' (1900); 'God's Puppets' (1901).

Clark, J. Scott, American educator: b. Copenhagen, N. Y., 23 Sept. 1854. He was graduated from Syracuse University in 1877, was professor of rhetoric there, 1882-92, and has

been professor of English in Northwestern University, Evanston, Ill., from 1892. He has published: 'A Practical Rhetoric' (1886); 'The Art of Reading Aloud' (1892); 'A Study of English Prose-Writers' (1898); 'A Study of English and American Poets' (1900).

Clark, Sir James, Scottish physician: b. Findlater, Banffshire, 14 Dec. 1788; d. Bagshot Park 29 June 1870. He studied medicine at the University of Edinburgh, and entered the navy as assistant-surgeon in 1809, and continued in the service till 1815, when he returned to Edinburgh. After devoting some time to foreign travel, he settled in Rome, where he continued to practise from 1818 to 1826. He returned to England in 1826, and became physician to the Duchess of Kent in 1835, and on the accession of Queen Victoria was appointed first physician in ordinary to the queen, and shortly afterward made a baronet. He retired from practice several years before his death, but continued till near the close of his life to act as consulting physician to the royal family.

Soon after his return to England Sir James Clark published, as a result of his continental observations, a work 'On the Sanative Influence of Climate' (1829), and in 1835 a 'Treatise on Pulmonary Consumption and Scrofula.'

Clark, James Gowdy, American balladist: b. Constantia, N. Y., 28 June 1830; d. Pasadena, Cal., September 1897. He was well known as a concert singer and song writer, and among his most popular songs are: 'Star of My Soul'; 'The Awakening'; 'The Beautiful Hills'; 'The Children of the Battlefield'; 'Freedom's Battle Hymn'; 'The Evergreen Mountains of Life'; and 'The Old Mountain Tree.'

Clark, John Bates, American economist: b. Providence, R. I., 26 Jan. 1847. He was graduated at Amherst in 1872, and has been prominent as a political economist since the publication of his 'Philosophy of Wealth'; 'Wages'; 'Capital and Its Earnings'; and 'The Distribution of Wealth.' In 1895 he became professor of political economy at Columbia University.

Clark, John Emory, American scientist: b. Northampton, N. Y., 8 Aug. 1832. He was graduated at the University of Michigan in 1856, and studied at Heidelberg. After serving in the Civil War as captain and colonel, he became professor of astronomy at Antioch College. Since 1873 he has been professor of mathematics at the Sheffield Scientific School of Yale University.

Clark, John Willis, English writer, registrar of the University of Cambridge from 1891. He is the author of 'Cambridge' (1880); 'Architectural History of the University and Colleges of Cambridge' (1882); 'Libraries in the Mediæval and Renaissance Periods' (1894); 'Augustinian Priory Observances' (1897); 'Old Friends at Cambridge and Elsewhere' (1900); 'The Care of Books' (1901).

Clark, Jonas Gilman, American philanthropist: b. Hubbardston, Mass., 1 Feb. 1815; d. Worcester, Mass., 23 May 1900. He began life as a carriage maker and acquired a fortune in business and real estate investments. He is noted as the founder of Clark University (q.v.), at Worcester, Mass., which he endowed with \$2,000,000 in 1887. He also conferred gifts on his native town. He bequeathed \$200,000 to

CLARK

Clark University outright and \$1,000,000 and the residue of his estate conditionally.

Clark, Joseph, English painter: b. Cerne Abbas, Dorsetshire, 4 July 1834. He was educated by "The Dorset Poet," William Barnes (q.v.), went to London at 18 and became a student at the Royal Academy. He first exhibited at the Royal Academy in 1857, and has exhibited there nearly every year since. Among well-known pictures by him are: 'The Return of the Runaway'; 'Hagar and Ishmael'; 'Three Little Kittens.'

Clark, Lewis Gaylord, American journalist and humorous writer: b. Otisco, N. Y., 5 March 1810; d. Piermont, 3 Nov. 1873. In 1834 he became editor of the 'Knickerbocker Magazine,' and with Irving, Bryant, Longfellow, Halleck, and Willis, as contributors, made it the foremost literary publication of that time, and an inspiration to a higher standard of periodical literature. The 'Editor's Table,' written by him, overflowed with amusing stories and witty sayings. The 'Knickerbocker Sketch-Book' (1850), and 'Knick-Knacks from an Editor's Table' (1853), are his only publications in book form.

Clark, Lewis George, American slave and freedman: b. about 1811; d. Lexington, Ky., 16 Dec. 1897. He was reared a slave, but escaping, lectured for emancipation in 1841-50. He claimed to be the original of "Uncle Tom" in Mrs Stowe's novel, but this the authoress denied.

Clark, Theodore Minot, American architect: b. Boston, Mass., 20 Aug. 1845. He was graduated from Harvard in 1866, and has been professor of architecture in the Massachusetts Institute of Technology in Boston for many years. He has published 'Building Superintendence'; 'Owner and Builder Before the Law'; 'Rural School Architecture.'

Clark, Thomas March, American Protestant Episcopal bishop: b. Newburyport, Mass., 4 July 1812; d. 7 Sept. 1903. He was graduated at Yale in 1831, and four years later entered the Presbyterian ministry, but in 1836 took orders in the Episcopal Church. He was successively rector of Grace Church, Boston, 1836-43; St. Andrew's, Philadelphia, 1844-7; Trinity Church, Boston, 1847-51; and Christ Church, Hartford, Conn., 1851-4. In the year last named he was consecrated bishop of Rhode Island. From 1899-1903 he was the presiding bishop of the Episcopal Church. He has written: 'Formation of Character'; 'The Efficient Sunday-school Teacher'; 'The Dew of Youth'; 'Early Discipline and Culture'; 'Reminiscences' (1895).

Clark, Walter, American jurist: b. Halifax, N. C., 19 Aug. 1846. He was graduated at the University of North Carolina in 1864; became a lawyer in 1868, judge of the superior court in 1885, of the supreme court 1889-1903 and has been chief justice since 1 Jan. 1903. He is a contributor to leading magazines on current topics and a law writer of authority, his best known work being 'Overruled Cases' (1884). Other works by him are: 'Annotated Code of Civil Procedure'; 'Laws for Business Men.' In 1896 the North Carolina Democratic convention indorsed him as a candidate for the vice presidency, and in 1903 Mr. William J. Bryan expressed his preference for him.

Clark, William, American explorer; brother of George Rogers Clark (q.v.): b. Virginia 1 Aug. 1770; d. St. Louis, Mo., 1 Sept. 1838. He emigrated with his family at the age of 14 to the falls of the Ohio, in Kentucky, on the present site of Louisville. In 1808 he was appointed in conjunction with Capt. Meriwether Lewis to the command of an expedition designed to explore the northwest territory lying between the Mississippi and the Pacific Ocean. He acquitted himself with consummate ability in this hazardous employment, which required the combination of military and scientific skill. His journal and the account kept by him of the astronomical observations made by him and Capt. Lewis have been published. He was appointed in 1813 governor of the Northwest Territory and superintendent of Indian affairs, which offices he retained till 1820, when Missouri was created a State. Two years afterward he was again appointed commissioner and superintendent of Indian affairs.

Clark, William, American thread manufacturer: b. Paisley, Scotland, 1841; d. Portland, England, 7 July 1902. Entering the Scottish thread mills established by his family, he made himself conversant with all details of the business and in 1860 came to the United States. Here he joined his brother, George A. Clark, who had preceded him by four years, and established at Newark, N. J., a small branch of the Scottish business. From this was built up in time the great Clark thread mills of Newark. After the death of George Clark, in 1873, the business was solely managed by his brother William. At the latter's death he left bequests of \$10,000 to each of three Newark benevolent institutions, \$6,000 to a fourth, and \$10,000 to Rutgers College.

Clark, William Andrews, American politician: b. near Connellsville, Pa., 8 Jan. 1839, of Protestant Irish farmer stock. His preparation for college was interrupted by the removal of his family to Iowa, where he attended an academy at Birmingham and studied law two years, but never practised. He taught school in Missouri 1859-60; was a miner in Colorado 1862-3; and in 1863 migrated to Idaho, where he set up in trade, and was soon one of the chief merchants in the Territory. In 1867 he contracted for a Star Route in Montana; and in 1868 formed a copartnership for a mercantile and banking business there. To qualify for the mining business, he took a complete course at Columbia School of Mines 1872-3. Since then he has been identified with mining interests in every mining region of the West, and has for many years been the largest individual metal producer of the world, besides having interests in manufacturing, railroading, mercantile business, etc. He was State orator to represent Montana at the Philadelphia Centennial of 1876, and a commissioner of the New Orleans Exposition of 1884; was Masonic Grand Master of Montana in 1877; in 1878 was major in the Nez Percé war against Chief Joseph; and was president of the constitutional convention when Montana was admitted to the Union. In 1898 he was elected to the Senate from Montana, but a protest was filed and an investigation ordered; before a report was made he resigned, returned to Montana, and was re-elected for the term 1901-7. He has been placed on many of

CLARK — CLARKE

the most important senatorial committees, including that on foreign relations.

Clark, William Bullock, American scientist; b. Brattleboro, Vt., 15 Dec. 1860. He was graduated at Amherst College in 1884. After a course of European study he became instructor in geology at Johns Hopkins University in 1887, and since 1894 has been professor of geology there. In 1891 he was appointed director of the Maryland Weather Service.

Clark, William George, English scholar: b. March 1821; d. York 6 Nov. 1878. He was educated at Trinity College, Cambridge, took orders in the Established Church but gave up his orders in 1869, explaining his reasons therefor in a pamphlet 'The Present Dangers of the Church of England' (1870). He assisted in founding the 'Journal of Philology' in 1868, but is best known for his editorship with William Aldis Wright (q.v.) of the noted 'Cambridge Shakespeare' (1863-6). The 'Globe Shakespeare' (1864) was also edited by Clark and Wright. Clark published also 'Lectures on the Middle Ages and the Revival of Learning' as well as lesser works.

Clark, Willis Gaylord, American poet, twin brother of Lewis Gaylord Clark (q.v.): b. Otisco, N. Y., 5 March 1810; d. Philadelphia, Pa., 12 June 1841. He became associate editor of the *Columbian Star*, a religious weekly paper (1830), but resigned shortly after to take charge of the *Philadelphia Gazette*. His longest poem is 'The Spirit of Life' (1833). A complete edition of his poems, edited by his brother, appeared in 1847.

Clark River (named after Capt. William Clark), a river of the United States, rising in the Rocky Mountains in western Montana, about lat. 45° 30' N. After a winding northwest course of about 650 miles between the Missouri and Bitter Root ranges, during which it expands into an extensive lake, it falls into the Columbia, in the State of Washington, lat. 48° 50' N., lon. 117° 50' W. It is also called Clark Fork of the Columbia River.

Clark University, a co-educational institution in Atlanta, Ga.; organized in 1870 under the auspices of the Methodist Episcopal Church; reported at the end of 1902: Professors and instructors, 20; students, 580; number of volumes in library, 1,000; value of property, \$250,000; president, Charles M. Melden, D.D.

Clark University, Worcester, Mass., founded in 1887 by the gift of Jonas G. Clark (q.v.), and the work of instruction began in 1889. At first the institution was devoted wholly to post-graduate work, those only were admitted as students who had taken a first degree and who gave promise of high attainment in some department of science. No entrance examination was required. The design and organization of the university were intrusted to G. Stanley Hall (q.v.) formerly a professor of philosophy at Johns Hopkins University, Baltimore, and for years a close observer of schools and school methods in America and Europe.

But few departments have been organized, namely, mathematics, physics, anthropology, biology, philosophy, and psychology. Pedagogy (1899) was made one of the sub-departments of psychology. One of the characteristic features

in the design is that professors and students should meet on the same plane, the professors to be as older students, the students to lecture occasionally on special subjects. Original work is encouraged and demanded, and a number of fellowships and scholarships have been founded so that worthy students of limited means might devote themselves to research along special lines, and not be hindered or hampered by doing outside work for the purpose of continuing their studies. No attempt has been made to secure large numbers of students; in such a school a small number is desirable. In 1892-3 there were 53 students; in 1896-7, 38; in 1898-9, 48.

There are 11 professors, 16 fellowships, and 16 scholarships. In the library are 18,000 volumes, and the following publications are issued by the university, but not officially: 'American Journal of Psychology'; 'Pedagogical Seminary'; 'Mathematical Review.'

In 1902 a collegiate department was opened with Carroll D. Wright as president. G. Stanley Hall is president of the university. See HALL, G. STANLEY.

Clarke, Adam, Methodist clergyman and scholar: b. Moybeg, County Londonderry, Ireland, 1762; d. London 26 Aug. 1832. He became an itinerant Methodist preacher in 1782, and continued to travel in various circuits till 1805, when he took up his residence in London, where he passed a considerable part of his subsequent life. He was learned in the Oriental languages, and published a commentary on the Scriptures (1810-26), and various other works, among the rest a 'Bibliographical Dictionary' (1802).

Clarke, Annie, American actress: b. Boston, Mass., 1845; d. Chicago 22 May 1902. Her first appearance was at the Boston Museum in 1853 as the Duke of York in *Richard III*. For several years she acted in juvenile parts in various places, but from 1861 till 1892 was a member of the stock company at the Boston Museum, soon becoming the leading actress there. She was a general favorite, but until 1892 was seldom seen outside of Boston. After that date she played in Chicago and other cities.

Clarke, Augustus Peck, American physician: b. Pawtucket, R. I., 24 Sept. 1833. He was graduated at Brown University in 1861, and at the Harvard Medical School in 1863. He was an army surgeon during part of the Civil War, and subsequently entered private practice. He has been sent to every International Medical Congress since 1887, and since 1894 has been dean of the College of Physicians and Surgeons in Boston. He has attained special eminence in the domain of obstetrics and gynecology.

Clarke, Benjamin Franklin, American educator: b. Newport, Maine, 14 July 1831. He was graduated at Brown University in 1863, and subsequently became professor of mechanical engineering there. In 1898-9 he was acting president of the university.

Clarke, Charles Cowden, English writer: b. Enfield, Middlesex, 15 Dec. 1787; d. Genoa, Italy, 13 March 1877. His father kept a small school and had John Keats as one of his pupils; but in 1810 gave it up and removed to Ramsgate. The son frequently went up to London,

CLARKE

where he came into contact with Leigh Hunt, Shelley, Hazlitt, the Lambs, and Vincent Novello, and in 1828 he married Mary, the eldest daughter of Novello. He engaged for some time in business as a bookseller and a music publisher, and from 1834 till 1856 lectured throughout the country, mainly on poets and poetry. His publications include his 'Hundred Wonders' (1814); 'Adam the Gardener' (1834); 'Shakespeare Characters,' chiefly those subordinate (1863); and 'Molière Characters' (1865), the two last being collections of some of his lectures. He is best known, however, by the edition of Shakespeare which he annotated in conjunction with his wife, and by the 'Shakespeare Key' (1879).

Clarke, Creston, American actor: b. Philadelphia 20 Aug. 1865. He is a son of John Sleeper Clarke (q.v.), and was educated at academies in Paris and London with a view to the stage, and made his début in London 1882. He has attained success in tragic roles, and has written 'The Last of His Race' and other plays.

Clarke, Edith Emily, American librarian: b. Syracuse, N. Y., 5 Nov. 1859. She was graduated at Syracuse University in 1881, and after teaching school some years, took up library work. Having served as cataloguer at Columbia University Library and at the Newberry Library in Chicago, she became chief cataloguer of public documents for the National Government in 1895, and librarian of the University of Vermont in 1898.

Clarke, Edward Daniel, English traveler: b. Willington, Sussex, 1769; d. London 9 March 1822. In 1799 he started on an extensive and laborious tour through Denmark, Sweden, Lapland, Finland, Russia, Tartary, Circassia, Asia Minor, Syria, Palestine, Egypt, Greece, and Turkey, returning in 1802 through Germany and France. On his return he obtained from Cambridge University the honorary degree of LL.D., in consideration of the services rendered to its public libraries and institutions by his liberal contributions, among which the greatest, perhaps, in value is the celebrated manuscript of Plato's works, with nearly 100 others, and a colossal statue from Eleusis, believed by him to be that of Demeter (Ceres). To him also the British nation is indebted for the acquisition of the famous sarcophagus of Alexander the Great, which he discovered in the possession of the French troops in Egypt, and which was by his means surrendered to the British army. In 1807 he commenced a course of lectures on mineralogy at Cambridge, and in 1808 a professorship of mineralogy was instituted there in his favor. He himself had made a splendid collection of mineralogical specimens, which was purchased after his death by Cambridge University. In 1805 he became vicar of Harlton, and in 1809 rector of Yeldham, Essex. In 1817 he was appointed librarian of Cambridge University. A complete edition of his travels appeared in 6 volumes (1810-23), and another in 11 volumes (1816-24), under the title of 'Travels in Various Countries of Europe, Asia, and Africa.' His 'Travels,' which are the most popular of his works, are attractive from the enthusiasm of the writer and his prolific imagination.

Clarke, Sir Edward George, English legal writer: b. London 15 Feb. 1841. He was admitted a barrister of Lincoln Inn in 1864, and was solicitor-general 1886-92. He sat in the House of Commons for Southwark in 1880, and for Plymouth 1880-1900. He has published 'Treatise on the Law of Extradition' (1866, 3d ed. 1888), and three collections of 'Public Speeches.'

Clarke, Frank Wigglesworth, American chemist: b. Boston, Mass., 19 March 1847. He was graduated from the Scientific School of Harvard University in 1867, was instructor at Cornell 1869, professor in Howard University 1873-4, and professor of chemistry and physics, University of Cincinnati 1874-83. He has been chief chemist of United States Geological Survey and honorary curator of minerals, United States National Museum, since 1883. He is a member of many American and foreign scientific societies, and was a member of the International Jury of Awards at the Paris Exposition of 1900, and received from the French government the decoration of the Legion of Honor. He has published: 'Weights, Measures and Money of All Nations'; 'Elements of Chemistry'; 'A Report on the Teaching of Chemistry and Physics in the United States'; the Smithsonian 'Constants of Nature,' and various official bulletins. He is also author of more than a hundred scientific essays and memoirs published in magazines and scientific journals. His most important contributions to science have been his 'Revaluation of Atomic Weights,' and his investigations upon the constitution of the natural silicates. He is joint author with L. M. Dennis of two recent works, 'Elementary Chemistry' and 'A Laboratory Manual.'

Clarke, Sir George Sydenham, English soldier and colonial governor: b. Lincolnshire 4 July 1848. After being educated at Haileybury College he entered the Royal Engineers' service and served in the Egyptian expedition in 1882, in the Sudan expedition 1885, at Suakin and elsewhere, and was knighted in 1893. Since 1901 he has been governor of Victoria, Australia. He has published: 'Practical Geometry and Engineering Drawing'; 'The Principles of Graphic Statics'; 'Plevna'; 'Fortification: Past, Present, and Future'; 'The Last Great Naval War'; 'The Navy and the Nation'; 'Imperial Defense'; 'Russia's Sea Power.'

Clarke, Helen Archibald, American writer: b. Philadelphia. She graduated from the musical department of the University of Pennsylvania 1884; began writing literary articles for the magazines in 1887, and in 1889, with Charlotte Porter, founded 'Poet Lore,' a journal devoted to the study of literature, and to literary criticism, which has maintained a high degree of excellence under her editorship. She has devoted herself especially to the study of Browning, and has edited several editions of his works in part or as a whole, and written a score of interpretative articles on the man and his work. She has composed considerable piano music, and contributed frequently to the various musical journals. Her work has appeared in 'Shakespeareana,' the 'Browning Society Papers,' 'Open Court,' 'Popular Science Monthly,' 'The Conservator,' 'Philadelphia American,' 'Music Review,' etc.

CLARKE

Clarke, Hyde, English philologist: b. London 1815; d. there 1 March 1895. In diplomacy, civil engineering, and scholarship he was equally at home, his versatility being conspicuous in 'Theory of Railway Investment', 'Colonization in our Indian Empire' (1857), 'Comparative Philology' (1858), and 'Examination of the Legend of Atlantis' (1886); 'Early History of the Mediterranean Populations,' etc. He also compiled a useful abridged English Dictionary.

Clarke, James Freeman, American Unitarian clergyman and author: b. Hanover, N. H., 4 April 1810; d. Boston, Mass., 8 June 1888. His first pastorate was at Louisville, Ky., 1833-40. He then settled in Boston in 1841; and was pastor of the Church of the Disciples which was organized especially for him, and of which he had charge till his death. He was a clear thinker and a leader in all reform and educational movements. From 1867-71 he was professor of natural religion and Christian doctrine in Harvard University. Together with Emerson and William H. Channing, he prepared the 'Memoirs of Margaret Fuller d'Ossoli.' His chief work was 'Ten Great Religions.' Among others were: 'Service Hymn-book and Hymn-book of the Church of the Disciples'; 'Christian Doctrine of Prayer'; 'The Hour Which Cometh'; 'Orthodoxy: Its Truths and Errors'; 'Steps of Belief'; 'Events and Epochs in Religious History'; 'The Ideas of the Apostle Paul'; 'Self-Culture'; 'Anti-Slavery Days'; 'Every-Day Religion'; and 'Vexed Questions.'

Clarke, John, American clergyman: b. Suffolk, England, 8 Oct. 1609; d. Newport, R. I., 26 April 1676. He was a physician in London, and came to Massachusetts soon after its first settlement; but being one of the friends of Anne Hutchinson, was obliged to flee with her and her associates from that colony. Proceeding to the south, they were welcomed by Roger Williams to his vicinity, formed themselves into an organization, and obtained from the Indians a district to which they gave the name of the Isle of Rhodes or Rhode Island. The settlement commenced in 1638, at Pocasset, and Clarke began to employ himself as a preacher. In 1644 he founded at Newport the second Baptist Church in America, and became its pastor. Venturing a few years later to preach in the vicinity of Boston, he was arrested by an officer of the government, was called first before a parish meeting and then before the court, and was condemned for what were adjudged false teachings, to pay a fine of 20 pounds or be publicly whipped. In 1651 he was sent to England in company with Roger Williams as an agent of the colony of Rhode Island, and published there a book entitled 'Ill News from New England, or a Narrative of New England's Persecution.' He succeeded in obtaining a revocation of Mr. Coddington's commission as governor, and remained in England after the return of Williams, till at the end of a 12 years' mission he had procured a second charter for the colony, which secured to every person at all times his own judgment and conscience in matters of religious concernment. Bancroft alludes to him in his history as "the modest and virtuous Clarke, the persevering and disinterested envoy." Upon his return in 1663

he resumed the pastorate of his church at Newport, which he retained till his death. In his will he left his farm for charitable purposes, the income of it only to be expended; and it has since produced annually about \$200.

Clarke, John Mason, American scientist: b. Canandaigua, N. Y., 15 April 1857. He studied at Amherst and Göttingen and from 1881 to 1884 was professor of geology at Smith College. He subsequently became State palæontologist of New York, and has written numerous pamphlets and papers on geology and palæontology.

Clarke, John Sleeper, American actor: b. Baltimore, Md., 3 Sept. 1833; d. London, Eng., 14 Sept. 1899. He began his stage career in childhood and played comedy parts with success from 1851 to 1869. He then became a theatrical manager and with his brother-in-law, Edwin Booth, made paying ventures in various houses of amusement in the United States and England.

Clarke, Joseph Ignatius Constantine, American journalist and playwright: b. Kingstown, Ireland, 31 July 1846. He emigrated to the United States in 1868, and was on the editorial staff of the New York *Herald* 1870-83; edited New York *Journal* 1883-95; and the 'Criterion' 1898-1900. His plays include: 'Heartsease'; 'For Bonnie Prince Charlie'; 'The First Violin'; 'Her Majesty'; and he has also published 'Robert Emmet,' a tragedy in blank verse (1888); 'Malmorda, a Metrical Romance' (1893).

Clarke, McDonald, American poet: b. Bath, Maine, 18 June 1798; d. New York 5 March 1842. He was an eccentric character, familiarly known as "the mad poet"; and was the subject of an amusing poem by Halleck, called 'The Discarded.' The subjects of Clarke's verses were usually the belles of the city and topics of the day. His works include: 'Poetic Sketches' (1826); and 'The Belles of Broadway' (1833). One of his poems was 'Now Twilight Lets Her Curtain Down.'

Clarke, Marcus Andrew Hyslop, Australian novelist: b. London 24 April 1846; d. Melbourne, Australia, 2 Aug. 1881. He went to the island in his 24th year, took up journalism and acquired the experience of bush life and the knowledge of antipodean men and things of which such brilliant use is made in 'His Natural Life,' a striking convict story; 'Holiday Peak'; 'Old Tales of a New Country,' and other vivid fictions.

Clarke, Mary Bayard, American author: b. Raleigh, N. C., about 1830. While living in Cuba, she published verses signed "Tenella" in the periodicals. After her return in 1855 she wrote 'Reminiscences of Cuba' for the 'Southern Literary Messenger.' Among her works are war lyrics and translations from Victor Hugo; also prose articles signed "Stuart Leigh." In 1870 was published her poem, 'Clytie and Zenobia, or the Lily and the Palm,' and 'Wood Notes,' a compilation of North Carolina verse.

Clarke, Mary Victoria Novello Cowden, English story-writer, essayist, and Shakespearian scholar: b. London 22 June 1809; d. Genoa, Italy, 12 Jan. 1898. She married in 1828 Charles Cowden Clarke, with whom she wrote the 'Shakespeare Key' and compiled an edition

CLARKE — CLARKSON

of Shakespeare's plays. Her best known work is her 'Concordance to Shakespeare,' published in 1845, which cost 16 years' labor. Other works from her pen are: 'The Girlhood of Shakespeare's Heroines' (1850); 'World-noted Women' (1857); 'The Trust and Remittance' (1873); 'A Rambling Story' (1874).

Clarke, Rebecca Sophia ("SOPHIE MAY"), American novelist: b. Norridgewock, Maine, 22 Feb. 1833; d. there, 16 Aug. 1906. She wrote 'The Dotty Dimple,' 'Flaxie Frizzle' stories, etc., for children; and the novels, 'Her Friend's Lover'; 'The Asbury Twins'; 'Quinnebasset Girls,' etc.

Clarke, Richard Henry, American author: b. Washington, D. C., 3 July 1827. He became president of the Society of American Authors in 1891. He has written 'The New Crusade of the Nineteenth Century,' relating to the Church and slavery; 'Socialism in America'; 'Biography of Commodore John Barry, Founder of the American Navy'; 'Father Sebastian Rale,' an answer to Gladstone on 'Maryland Toleration'; an 'Illustrated History of the Catholic Church in the United States'; 'Lives of the American Catholic Bishops'; and 'Old and New Lights on Columbus.'

Clarke, Samuel, English theological and philosophical writer: b. Norwich, 11 Oct. 1675; d. London 17 May 1729. He became chaplain to Dr. More, bishop of Norwich, and between 1699 and 1701 published 'Essays on Baptism, Confirmation and Repentance,' replied to Toland's 'Amyntor,' and issued a paraphrase of the Gospels. He was then presented with two livings, and in 1704 and 1705 twice delivered the Boyle lectures at Oxford on 'The Being and Attributes of God,' and on 'The Evidences of Natural and Revealed Religion.' In 1706 he published 'Immortality of the Soul,' and a Latin version of Newton's 'Optics.' He was then appointed rector of St. Bennet's, London, and shortly afterward rector of St. James' and chaplain to Queen Anne. In 1712 he edited Cæsar's 'Commentaries,' and published his 'Scripture Doctrine of the Trinity,' which became a subject of much controversy and of complaint in the Lower House of Convocation. His later productions were his discussions with Leibnitz and Collins on the 'Freedom of the Will,' and his Latin version of part of the 'Iliad.'

Clarke, William Horatio, American organist: b. West Newton, Mass., 1840. He filled positions as organist in Dedham, Boston, and Woburn; was for some years superintendent of schools at Dayton, Ohio; was organist of Tremont Temple, Boston, Mass., 1878-87, when he retired to Reading, Mass., where he built the fine four-manual organ in Clarigold Hall. He has published: 'New Method for Reed Organs' (1869), and 'Outline of the Structure of the Pipe Organ' (1877).

Clarke, William Newton, American Baptist clergyman: b. Cazenovia, N. Y., 2 Dec. 1841. He graduated at Colgate University 1861, and at Hamilton Theological Seminary 1863. He filled Baptist pastorates at Keene, N. H., Newton Centre, Mass., Montreal, and Hamilton, N. Y., 1863-90, and was a professor in Toronto Baptist College 1883-7. Since 1890

he has been professor of Christian theology at Colgate University, Hamilton, N. Y. He has written: 'Commentary on Mark' (1881); 'Outline of Theology' (1897); 'What Shall We Think of Christianity?' (1899); 'A Study of Christian Missions' (1900).

Clarksburg, W. Va., city and county-seat of Harrison County, situated in the north central part of the State, on the West Fork River, a branch of the Monongahela, and on the Parkersburg branch of the Baltimore & Ohio Railroad, 22 miles west of Grafton. The Short Line, the Monongahela, and the West Virginia and Pittsburg divisions of the Baltimore & Ohio Railroad also enter the city.

Industries.—The city lies in a section abounding in natural resources, natural gas, coal, and oil being plentiful; and the farm, grazing, and timber lands very valuable. Clarksburg is called the "Fuel City of the Fuel State." The manufactures are many and varied, there being glass, art pottery, chair, and cigar factories, chemical and carbon works, wood-working plants, machine shops, foundries, bottling works, a brewery, and a grain elevator with a capacity of 80,000 bushels. There are five newspapers, daily and weekly combined.

Banks, Public Institutions, etc.—There are five banks in the city with a combined capital of \$675,000, and doing an annual business of \$90,000,000. Among the notable public institutions are the City, the Kesler, and the Harrison County hospitals.

Educational Institutions, Churches, etc.—There is an excellent free school system with a public high school, supplemented by Broadus Classical and Scientific Institute, Saint Joseph's Academy, and Elliot Commercial College. The city has nine church edifices.

History, Government and Population.—The city was first settled in 1772, became a borough in 1785, and was incorporated as a city in 1899. The city is proud of having been the birthplace of the famous "Stonewall" Jackson. Its municipal affairs are administered by a mayor, recorder, chief of police, and a council of 10 members, one half of whom are elected each year. Pop. (1905) 10,000.

F. L. BURDETTE,
Superintendent of Schools.

Clarkson, Matthew, American soldier and philanthropist: b. New York 17 Oct. 1758; d. there 25 April 1825. Both his father and grandfather were prominent colonial officials. He was with the Northern army in 1777; was wounded at Fort Edward; at Saratoga acted as aide-de-camp to Gen. Benedict Arnold, and was present at Burgoyne's surrender. He also took part in the campaigns in the Carolinas 1781, and was aide to Gen. Benjamin Lincoln at Yorktown. He was brevetted a lieutenant-colonel, and for 14 years was major-general of the New York militia and a member of the State legislature.

Clarkson, Thomas, English philanthropist and emancipationist: b. Wisbeach, Cambridgeshire, 28 March 1760; d. Playford Hall, near Ipswich, 26 Sept. 1846. He was originally intended for the Church, and studied at Saint John's College, Cambridge. He formed a connection with a Quaker

CLARKSVILLE — CLASSICAL GREEK POETRY

association for the suppression of negro slavery, and was introduced to Mr. Wilberforce and other distinguished individuals. While the latter advocated the cause of abolition in Parliament, Mr. Clarkson was indefatigable in obtaining information and evidence on the subject, in attending meetings in different parts of the country, and generally conducting the agitation throughout England for the suppression of the slave traffic. In 1788 a committee of the privy council made an inquiry into the state of the African trade, and in that year a bill mitigating some of the worst cruelties of the traffic was passed. In 1791 a motion by Wilberforce in favor of putting an end to the traffic was lost by 163 to 88; but his labors, and those of his party, were at last successful in England, the slave-trade being abolished by a bill passed 25 March 1807. This point gained, their next effort was to procure the total abolition of slavery in the British colonies, and in this also, after a long struggle, they succeeded, by the passing of the emancipation act in 1833. He published, 'A Portraiture of Quakerism' (1806); 'History of the Abolition of the African Slave-trade' (1808); 'Memoirs of the Private and Public Life of William Penn' (1813); 'Researches, Antediluvian, Patriarchal, and Historical' (1836).

Clarksville, Tenn., a city and county-seat of Montgomery County, situated on the Louisville & N. R.R. near the junction of the Red and Cumberland rivers. It is the trade centre of a large tobacco-growing district, and has a number of tobacco factories, being one of the 10 leading cities of the United States in the manufacture of snuff. It has also lumber and flour mills. It is the seat of the Southwestern Presbyterian University, and of a Methodist school for girls. Pop. (1900) 9,431.

Clarksville, Tex., the county-seat of Red River County, on the Texas & P. R.R., about 15 miles south of the Red River, and 100 miles northwest from Dallas. It is the centre of a fertile cotton country, and its industries are such as are related to the raising and marketing of this staple, with some traffic in grain, hides, and live stock. Pop. (1900) 2,069.

Clary, klā'ri, the name of several species of the genus *Salvia*, of the mint family (*Labiatae*). The plants are natives of countries bordering on the eastern Mediterranean, but are common in all civilized countries, and are cultivated for their aromatic or medicinal qualities. The wild clary, or wild sage, (*S. verbenaca*), is found wild in waste places imported from Europe. Clary, clear-eye, or sea-bright (*S. sclarea*), a native of Europe, is a common plant in Pennsylvania, where it has escaped from cultivation. It receives its common names from the employment of its mucilaginous seeds to remove specks from the eyes. In Europe the plant is used for flavoring soups and confectionery. Its flowers were formerly used with brandy, sugar, cinnamon, and a little ambergris, to make clary-water, regarded as a cardiac to help digestion.

Class, Classifying, Classification. When the domain of a science comprehends a very great number of objects which it is necessary to describe, or whose analogies and differences require to be assigned, it is always useful, and sometimes indispensable, to make a methodical

distribution of these objects, to group those which present the greatest number of common characters, to form with these groups new assemblages, continuing the process till a limit is reached where this mode of generalizing may be stopped. The highest assemblage in this ascending series is a "class" (though this term may not be technically applied to it); the procedure necessary in forming it is "classifying," and the result, extending over some entire branch of natural science, is a "classification." We do not begin to classify till we feel the need of it, for the task requires analysis, multiplied comparisons, and researches as to the means of generalizing the particular and isolated notions which we had previously been contented to amass without regular arrangement. It is only, however, after the revision necessary for such arrangement has been undertaken that science can be said to have begun. The first attempts at generalization and classification often exercise a very important influence on the future progress of any science, and may even extend to the period when it seems to be approaching its perfection. A science consists principally in the relations of the facts observed, or knowledge acquired in connection with it. If the relations thus established are founded on accurate observations, they become in fact laws of nature. the most important and most prolific truths which human reason is able to discover. But if the imagination has been allowed to take part in the work, if it has either furnished the materials or directed the construction of the edifice, it must sooner or later be demolished, and rebuilt with better selected materials and on more solid foundations. In modern times geology commenced with faults of this description, and still seems to have difficulty in avoiding them. Natural history, to which a good classification is so essential, was not very fortunate in its first combinations: systems took possession of it, and too often blinded the inquirer to great truths which otherwise he could hardly have failed to discover. Influenced by this love of system, many, instead of submitting to the laborious investigation of facts, have come forward with some new fanciful combination, and made it almost their sole business to secure the credit of their particular classifications by overthrowing those of their predecessors or rivals. In a subject so comprehensive as natural history it seems vain to hope for a perfect classification until the resources of embryology are exhausted. Zoology is gradually tending toward a consistent system of classification, the basis of which is the resemblances of animals at various periods of their growth. The impulse to this line of research was given by Darwin. Being a strictly natural method, inasmuch as the affinities by common descent are sought after to the neglect of mere outward resemblances at a later period of life, the arrangements suggested by it to different naturalists show a considerable amount of harmony, and even those who oppose Darwin acknowledge the simplicity and consistency of embryological or genealogical classification. For the classification of the animal kingdom See ANATOMY, COMPARATIVE.

Classical Greek Poetry, The Growth and Influence of, a work by Prof. Richard C. Jebb (1893). Delivered originally as lectures at Johns Hopkins University, these chapters compose a brilliant sketch of the history and character of Greek poetry.

CLASSICAL LITERATURE

Classical Literature. The term "Classical Literature" usually embraces the literatures of Greece and Rome, though separate periods of these and other literatures are often called classical.

GREEK LITERATURE.

Greek Literature may be conveniently divided into four periods, as follows: (1) Ancient or Classical, from Homer to Demosthenes (c. 700 to 300 B.C.); (2) Alexandrian, from 300 B.C. to the subjugation of Greece by Rome in 146 B.C.; (3) Græco-Roman, from 146 B.C. to the division of the empire in 330 A.D.; (4) Byzantine, from 330 A.D. to the capture of Constantinople in 1453 A.D.

I. THE CLASSICAL PERIOD.—The literature of the classical period is not artificial, but was developed naturally and in orderly succession, each branch of the race. Ionian, Æolian, Dorian, contributing its part, till the whole culminated in the glorious Attic, which is still the admiration of the educated world. We have no remains of Greek poetry before the Homeric poems, but the highly developed art shown in them as well as the smoothness of the metres shows that some form of poetry must have been cultivated before such a state of perfection could have been reached. As forerunners then we may mention the Linus song and the songs of Ialemus and of Hylas, also hymns to the gods, marriage hymns, dirges, all which must have attained considerable artistic form before the Homeric poems were composed. During this mythic period from which we receive barely the names, such as Orpheus, Musæus, and Eumolpus, to mention the best known, were developing metrical form, appropriate epithets, fixed phrases, which became the professional stock of later periods.

1. *Epic Poetry.*—The only remains of this early period are the Homeric poems, the 'Iliad' and the 'Odyssey.' The 'Iliad,' poem of Ilium or Troy, has for its subject the wrath of Achilles, about which is grouped in the most artistic way the development of the events during the 10 years' siege. It consists of 24 books and more than 15,000 lines. The 'Odyssey,' poem of Odysseus or Ulysses, tells of the wanderings and homecoming of Odysseus after the capture of Troy, into which are woven many beautiful myths giving light and shade to the dangers and trials through which the hero passed till he reached his home in Ithaca. This also consists of 24 books, but with only a little over 12,000 lines. Down to the end of the last century all the world believed that these poems were the work of one man, Homer, when Wolfe's 'Prolegomena ad Homerum' appeared in 1795. It is true that the ancients as early as 170 A.D. contended that Homer was the author of the 'Iliad,' though not of the 'Odyssey,' but this was as far as they went, and even then there was great opposition to this view of the "Separatists," as they were called. Vico, of Naples, about 1700, had suggested that Homer was a myth, but it remained for Wolfe to bring forward plausible proofs of his contention that the poems were not originally one composition, but made up of several shorter poems put together without common plan. Wolfe based his arguments on the belief that writing did not exist before 600 B.C., and that the poems were first collected and written down by order of Pisistratus and that poems of such length could not be

handed down by oral recitation. Following Wolfe, Lachmann and other scholars divided the poems into lays, which they believed were collected by a school of singers, called Homeridæ, and later put into their present form by order of Pisistratus. The question is still discussed, but scholars now generally accept the view that the two poems belong to separate periods, and that each is a growth from two or three smaller poems. The poems are probably Ionic in origin, though Fick has tried to show that they are Æolic. As epic lays must have existed in abundance before the 'Iliad' and 'Odyssey' were reduced to form, it is only natural that we should find many remains of epic songs, which along with a number of hymns were all credited to Homer, but which are now described as the Epic Cycle, which has come down to us from Proclus, probably the grammarian of the 2d century after Christ. These poems lack the unity of the 'Iliad' and 'Odyssey' and were far inferior to them. Among the most important were the 'Oedipodeia,' 'Thebaid,' and 'Epigoni,' all dealing with Thebes; the 'Ethiopid' and the 'Capture of Troy,' probably originally one poem, and the 'Little Iliad' were a continuation of the 'Iliad,' while the Cyprian lays were an introduction to it; the 'Nosti,' containing the story of the Greek heroes after the fall of Troy, and 'Telegony,' dealing with the death of Odysseus by his son Telegonus, fitted in with the 'Odyssey.'

2. *Didactic.*—Closely following epic poetry is the didactic, which is like epic in form and metre. Its origin is also obscure, but we must also here suppose that some forms existed before Hesiod (c. 800 B.C.), its great representative. His poem, 'Works and Days,' treats of the arts of husbandry with an attached calendar of 60 verses. The poem is a pessimistic complaint of life, with a high moral tone, filled with saws, maxims, allegories, etc., with occasional flashes of genius. The 'Theogony,' formerly attributed to Hesiod though probably not by him, treats of the origin of things and the genealogy of the gods. Other works ascribed to Hesiod are the 'Catalogue,' the 'Eoia,' the 'Ægimius,' and the 'Shield of Heracles.'

3. *Lyric.*—As epic was dying, lyric, which had lain dormant during this brilliant period, and which also has its origin in the above mentioned pre-historic hymns, dirges, etc., began to be artistically cultivated. This is a natural development, for when men began to look less to their overlord and to think more of their own concerns, this change of feeling was reflected in their poetry, and thus the new personal lyric sprang up in the place of the old impersonal epic that dealt with kings and their doings. Lyric may be subdivided into the Iambic and Elegiac, which are only partially lyric, and the melic, the true lyric type, which is itself subdivided into Æolic (or monodic) and Dorian (or choral) lyric. Preceding both these subdivisions is the nome, cultivated by Terpander and Olympus, of which only fragments remain.

(a) *Elegiac.*—This was used at first in threnodies and funeral lamentations, but by the 7th century its sphere was greatly extended and it was now employed to describe all sorts of personal reflections, especially of a didactic or moral nature. The metre is a distich consisting of an hexameter verse followed by the so-called pentameter, which is really a verse composed of two

CLASSICAL LITERATURE

catalectic dactylic trimeters. It was recited, not sung, and was very energetic and lively, being early used as a means of conveying personal reproach. Side by side and almost at the same time with the Elegiac was developed the Iambic, which was probably connected with the worship of Demeter. It early acquired a satyric turn, to which its lively tripping metre especially adapted it. It was an entirely different type from the Elegiac, but became early associated with it, because it had many characteristics in common, and the two types were often cultivated by the same poet. Like the Elegiac, the Iambic also soon gave up musical accompaniment. Among the masters in this department, may be mentioned Callinus (730 B.C.?) of Ephesus, who wrote martial elegies and was probably the first elegiac poet, though this honor is also claimed for Archilochus. Archilochus (700 B.C.) of Paros, who wrote some elegies, is mostly famed as the most illustrious wielder of iambic verse, which he is said to have invented and of which he is the earliest writer. Semonides (693 B.C.) of Amorgus, who has little originality, but is not without some elegance, is chiefly known by his satyric poem in iambic verse on women. Tyrtaeus (650 B.C.), the fabled lame schoolmaster of Athens, like Callinus, wrote martial elegies. Mimnermus (630 B.C.) of Colophon, the sweet-voiced singer, was the first to use elegy for the expression of love. Solon (594 B.C.) of Athens, the soldier and patriot, wrote elegies of a martial and political nature. Theognis (544 B.C.) of Megara was a sharp and poignant writer of gnomic elegy. Phocylides (540 B.C.) of Miletus was another gnomic writer, and finally comes Hipponax (546 B.C.) of Ephesus, best known as the inventor of the scazon, choliambic (or halting verse), which is an iambic trimeter that ends with a spondee, and thus produces a sort of shock, often humorous in effect. Here may also be mentioned the epigram, the literary form of which was the elegiac distich. It was cultivated by Archilochus to some extent, but the most distinguished writer of epigram was the lyric poet, Simonides of Ceos.

(b) *Melic.*—Unlike the preceding, the melic type was musical throughout. It was especially adapted to religious chants and held its sway in every realm of human passion. It is highly valuable, not only from a literary but also from an historical standpoint. The Æolian type, which was not only monodic, but also choral, is much simpler, less ornate, less involved than the Dorian, which was generally choral. Alcæus (606 B.C.) of Mitylene was a vigorous, graceful, passionate writer of songs of love, scholia, politics, and some hymns. Sappho (611 B.C.), also of Mitylene, though probably born at Eresos, the greatest of women poets, wrote love songs of the most passionate character, full of subtle charm and exquisite grace. She also wrote epithalamia. Both these poets used the highly colored Lesbian dialect and both were often imitated by Horace. Closely allied to these in form and content, though differing from them in dialect, was Anacreon (540 B.C.) of Teos, an Ionian city, who was a writer of love songs and hymns, and while not possessing the genius or passion of either Alcæus or Sappho, yet wrote graceful verse, with an occasional vein of humorous satire. The poems called 'Anacreontics' are imitations of the Alexandrian age, and are not

altogether bad, some possessing considerable merit. The Dorian type, much more ornate and more highly involved in structure and metre than the Lesbian, dealt mostly with matters of religion and of public interests, taking as its subjects the mythical traditions of the Dorians, and was sung at festivals in honor of the gods and heroes or in commemoration of some athletic victory or the founding of some city. The dialect is Dorian of an artistic literary type, and the form varied from the simple narrative to the highly artistic dialogue. The most important forms in the order of their development were the Pæan, a hymn of joyous thanksgiving to Apollo, the Hyporchema, also a hymn to Apollo, accompanied by dancing; the Parthenion, a sort of processional song, sung by a chorus of young girls; the Dithyramb, in honor of Dionysus, of a wild and passionate nature, sung by a chorus encircling an altar; also march songs, marriage songs, and such like. Thaletas (700 B.C.?) of Crete is mentioned as developing the Pæan, and Hyporchema, the metre of which he brought from his native land to Sparta. Alcman (650 B.C.) of Sardis wrote hymns, pæans, hyporchemata, and scholia, and especially gave artistic form to the Parthenion. His poetry is easy, graceful, and often tender. Arion (650 B.C.?) of Methymna is especially noted as the founder of the artistic dithyramb. Stesichorus (611 B.C.) of Himera in Sicily treated epic subjects in lyric form and is famous for adding the epode to the strophe and antistrophe, of choral song, whence he gets his name, his real name being Tisias. Ibycus (560 B.C.) of Rhegium in Italy, somewhat like Stesichorus in form and content, wrote both hymns and love songs. But the great masters of choral lyric arose after the Persian wars, which had a tendency to unite the widely scattered Greeks into one people and brought into prominence Athens, which then became the literary centre of the known world. Simonides (556 B.C.) of Ceos, an Ionian, of keen observation and philosophic temperament, gave his genius to the cultivation of the Dorian lyric and achieved the highest fame. He was also distinguished in other departments of poetry, notably the elegy and the epigram, hymns to the gods, pæans, dirges, odes of victory, etc. Simonides is also remarkable as being, so-to-speak, the first national poet, for he was an Ionian by birth, wrote in the Dorian dialect, and at Athens, the future world power. Next may be mentioned his nephew, Bacchylides (470 B.C.), of whom 20 poems practically complete and several long fragments were discovered in 1897, which give us a much higher opinion of this smooth and graceful poet. Greatest of all the lyric poets was Pindar (521 B.C.) of Thebes, who was a contemporary of Bacchylides and contended with him for prizes, but was by no means a rival, for Pindar is brilliant, lofty in diction and in thought, full of religious reverence, deeply in earnest, abounding in poetic imagery, of an independent genius, always grand. His extant works consist of 45 complete odes of victory, written in honor of the victors at the great national games, besides many fragments representing almost every species of lyric composition.

4. *Drama.*—As its name implies, drama is distinguished from epic by action, and grew out of the cult of Dionysus, which was deeply tinged with religion. The people of one section would

CLASSICAL LITERATURE

gather together and worship Dionysus, the god of wine, at vintage time. When in time, the chorus leader impersonating Dionysus told of some adventure, the chorus would burst into song suited to the feelings aroused by the story, which might be sad and dirge-like or joyous and hilarious. Later this story of adventure and the chorus singing developed into a dialogue, and when such dialogue was repeated several times during a festival and then extended to other myths, drama was begun. In time costumes were improved and masks were added; from the simple dialogue noted above, dialogue was now carried on between the chorus leader and one member of the chorus instead of the entire chorus, so that the number of actors was increased to two and later to three. The chorus was at the same time reduced to 12 or 15 (in comedy to 24), and thus became less prominent. When the drama developed, special actors were demanded and these were paid by the state. There was no theatre at first, though soon seats of wood were erected, and later of stone, cut out of the rock on the slope of a hill, with a capacity of 20,000 people; there was no covering. At the front of the seats was the orchestra or circular dancing place, in which was an altar, about which the chorus performed its evolutions. At the rear of the altar was a wall for the scenery and behind this was some rude machinery, such as the noted eccyclema, a sort of rolling platform; there was likely no stage. Dramatic representation was under the care of the state and consisted of a contest among three poets, each of whom contended with three pieces and a satyric drama. The drama was divided into tragedy and comedy, which grew up side by side, though tragedy was first to attain artistic form.

(a) *Tragedy*.—Passing by Thespis, Phrynichus and others who were helping to develop tragedy, we come to the masters. Æschylus, Sophocles, Euripides, in whose hands tragedy reached its greatest height. Æschylus (525-456 B.C.) was a stern, proud, deeply religious man, with a vigorous imagination, and gifted with the power of seeing the grand and terrible in nature. His plays show vigor and subtlety of thought rather than grace and delicacy. He is believed to have composed about 70 dramas and 20 satyr dramas, of which only seven have come down to us, the best being the 'Agamemnon' and the 'Prometheus Bound.' Sophocles (495-406 B.C.), the greatest of the three tragic writers, was a man of charming personality, endowed with brilliant poetic talent; his imagination was haply not so vigorous as Æschylus's, but more spontaneous and versatile, and he had a very keen insight into and appreciation of human nature. His plays exhibit deep reflection and serious thought combined with the most exquisite grace and perfection of form. Of about 120 plays only seven are extant, of which the best are the 'Antigone,' 'Electra,' and 'Œdipus Tyrannus,' the last being perhaps the greatest tragedy ever written. Euripides (480-406 B.C.), though a great poet, did not maintain the lofty standard set by Æschylus and Sophocles. He was a man of keen sensibility, with a highly impressionable and sympathetic nature, a glowing imagination, but thoroughly impregnated with the sophistry of his time. His plays have much grace and beauty, but lack the power of Æschy-

lus and the perfection of Sophocles. There are often passages of brilliant effect, and he rises to his greatest height in the portrayal of the innermost feelings of the heart. He was not so popular in his lifetime as he became later, and so of his 75 or 90 plays, only 18 are preserved, exclusive of the 'Rhesus,' which is certainly spurious. The best plays are perhaps the 'Medea,' the 'Iphigeneia at Aulis,' and the 'Ion.'

(b) *Comedy*.—From *comus*, which was a rustic procession bearing an emblem of fecundity and singing phallic chants at the country Dionysiac festivals, with which comedy was closely associated. When comedy became important it was taken under the care of the authorities at Athens and the competitions were held especially at the Lenæa, about the end of winter. Comedy is usually divided into the "Old," "Middle," and "New." Old comedy, which held sway from about 480 to 400 B.C., usually dealt with some political or moral subject, and was characterized by the wildest extravagance of fancy and indulgence of keen personal satire accompanied with brilliant and too often coarse wit. Like tragedy, it had a structure of its own which varied little in the different plays. The *Parabasis*, consisting of songs and spoken passages, is a relic of the old *comus* and was used to present the personal views of the poet. The language is the spoken Attic in its highest purity. The chief representatives of the old comedy are Cratinus, Crates, Pherecrates, Aristophanes, Eupolis, of whom Aristophanes (450 B.C.) is far the greatest. Eleven of his plays are extant showing the characteristics of old comedy, couched in elegant language and with the most exquisite grace. Middle comedy (400-330 B.C.) which arose at the end of the Peloponnesian War, loses the vivacity and extravagance of the old and has to do with character sketches and everyday life rather than with political satire. Its chief representatives were Antiphanes (425 B.C.?) and Alexis (390 B.C.). New comedy lost the chorus, and giving up the artificiality of the former period, came nearer to real life, taking its subjects from everyday experience, of which love is the enduring type. This is the prototype of the Latin comedians, Plautus and Terence, and was cultivated by Diphilus, Apollodorus, Philemon, Menander, Posidippus and others, of whom Menander (324 B.C.) was the greatest. No plays of these writers are extant, but the fragments abundantly testify to the loss we have sustained. Earlier than Attic comedy is Sicilian, which was cultivated chiefly by Epicharmus and Sophron.

5. *History*.—While poetry was at its highest point of development, Greek prose was coming into life in Ionia and now became the medium of philosophical writings, which had earlier used the almost prose Iambic verse. The beginnings of history were made by the compilers of ancient myths and legends, records of events, genealogies, etc., mostly of a local nature, and later they extended their sphere to foreign countries, when some geography and description were added, but wholly of an uncritical kind. Among these early writers of history may be mentioned Hecataeus of Miletus (c. 500 B.C.), Pherecydes of Leros (450 B.C.) and Hellanicus of Mitylene (450 B.C.). But the only one whose works are now extant is Herodotus of Halicarnassus (484-406 B.C.?), called the "Father of

CLASSICAL LITERATURE

History.) In the earlier part of his life he was a great traveller and visited nearly every part of the then known world, making researches for his future work. His history consists of nine books named after the Muses, of which the first part treats of the Persian empire, its rise and power, while the latter half deals with the Persian invasion of Europe. He weaves into his work much geographical and social material. He uses the Ionic dialect and is really the first writer of artistic prose. His style is simple, graceful, and charming. We cannot doubt his sincere search after truth, but his love for the marvellous and his great skill as a story-teller led him into exaggeration and caused him to bring in many side issues, which raise suspicion as to his credibility. Thucydides of Athens (471-400 B.C.), the greatest historian of Greece and one of the greatest of the world, wrote in eight books a history of the Peloponnesian wars, using the Attic dialect, and is justly styled the first philosophical historian, inasmuch as he not only gives the events, but also seeks the causes and the political and moral lessons to be drawn from them. Banished, probably for failure in a naval battle, he watched the progress of the war from the outside, but he was absolutely impartial. The speeches, largely imaginary, serve to convey his philosophical ideas of the causes of events. His style is exceedingly forceful and intense, but often involved and obscure, due in large measure to his striving after brevity, for every sentence is overcharged with thought. Xenophon (434-355 B.C.), also of Athens, continued the work of Thucydides in the first two books of his 'Hellenica,' which consists of seven books and is a very dry history, full of moralizings and with strong predispositions in favor of Sparta. His greatest work is the 'Anabasis,' in seven books, which is a very vivid account of the march of the ten thousand Greek mercenaries with Cyrus the Younger, when he tried to wrest the kingdom from his brother Artaxerxes. Xenophon was himself a member of the expedition, at first as an onlooker, but later as a leader, so that he gives us a vivid and interesting personal account of it. Among other works are 'Cyrædia' (or Education of Cyrus), a sort of historical romance, in eight books, the 'Memorabilia of Socrates,' a vindication of the great philosopher, the 'Œconomicus,' 'Hiero,' 'Convivium,' 'Agesilaus,' and other essays, some probably spurious. Other historians of whom only fragments are extant are Ctesias (415 B.C.) of Cnidus, physician at the court of Artaxerxes; Mnemon, who wrote, in Ionic Greek, histories of Persia and India. Philistus of Syracuse, Ephorus of Cyme, Theopompus of Chius, the last two from the school of Isocrates, and the authors of the Atthids, collections of historical and archæological material.

6. *Philosophy*.—Although philosophy had its beginnings in Ionia at the same time with history, we have no literature extant before Plato. Thales, Anaximander, and Anaximenes were the first to seek the causes of things and busied themselves with the physical world. Then came Heraclitus (335-475 B.C.) of Ephesus, whose work on nature, of which some fragments are extant, is among the oldest Greek prose, and Pythagoras (c. 540 B.C.) of Samos, who first used the name "philosophia," founded an independent school, and brought philosophy into closer touch

with everyday life. Xenophanes (c. 570 B.C.) of Colophon, the father of pantheism, founded the Eleatic School. He was followed by Parmenides (510 B.C.) of Elea, his disciple, and by Empedocles (492) of Agrigentum. Anaximenes (510 B.C.) of Clazomenæ was one of the deepest thinkers and carried philosophy to Athens, where it received its highest perfection in Socrates (469-399 B.C.), who, though he wrote nothing, gave the mightiest impetus to his disciples. First and foremost is Plato (438-348 B.C.) of Athens, who founded the Academic School. Plato, of a highly sensitive and poetic temperament, received the best possible education, which he enriched with extensive travel. He wrote much in every department of philosophy, ethics, metaphysics, politics, using the dialogue with Socrates as the central figure. The vivid imagination and dramatic style which are seen in all his writings, render them ever fresh and attractive. Forty-two dialogues are extant, of which about 25 are genuine, the best known being the 'Apology,' 'Crito,' 'Phædo,' with the longer works of the 'Republic' and the 'Laws.' Only fragments remain of Heraclides Ponticus, the scholar of Plato. Aristotle (384-322 B.C.) of Stagira was the most distinguished pupil of Plato and founded the Peripatetic School. He was a "practical" man, wholly unlike the idealist Plato. He ranged over the entire world of knowledge, treating everything from the practical standpoint, as opposed to the idealistic and speculative. His works, written in the common dialect, in a clear and precise, though often bald style, are very numerous, as he wrote on every department of knowledge, literature, philosophy, and science. His greatest works are perhaps the 'Logic,' the 'Nicomachean Ethics,' and the 'Politics.' Highly valuable also is the 'Athenian Constitution,' which was discovered in 1891.

7. *Rhetoric and Oratory*.—Real Greek prose began at Athens between 430 and 410 B.C. The great orators of the early period, Themistocles and Pericles, did not write their speeches, as did the later orators, of whom only ten were deemed worthy of a place in the Alexandrian canon. First in order comes Antiphon (480 B.C.), whose style, elaborate and rugged, exhibits a fondness for antithesis somewhat like that of Thucydides. Fifteen speeches are extant. Andocides (440 B.C.), of whom we have four speeches, is not a stylist, though he shows much force and vividness in description. These two cultivated judicial oratory. Lysias (440 B.C.) was an almost perfect stylist and greatly advanced Attic prose. Thirty speeches, composed in plain but graceful style, are extant. Isocrates (436 B.C.), of whose speeches 21 are preserved and who wrote speeches to be read rather than delivered, is famous for his smoothness of diction and periodic structure, a style which has been transmitted through Cicero to all the modern literatures. Isæus (420 B.C.), of whom we have 11 speeches and a fragment of a 12th, resembles Lysias in style, but is much more vigorous. Demosthenes (384 B.C.), who was a pupil of Isæus, carried oratory to its highest pitch. He was an indefatigable worker, and while his speeches may seem somewhat elaborated, as is charged, they are sincere, vigorous, and intense, showing purity of diction and perfection of form. Famous is the oration 'On the Crown' in reply to his contemporary, Æschines

CLASSICAL LITERATURE

(389 B.C.), himself a distinguished orator. Æschines has left us three speeches in good fluent style, but lacking in sincerity. Two other contemporaries were good orators, but far inferior, Lycurgus (390 B.C.) and Hypereides (389 B.C.).

8. *Medicine*.—The only works extant are those of Hippocrates (460 B.C.) of Cos, who was the founder of medicine. These are written in the Ionic dialect in plain language and without any pretensions to style.

II. ALEXANDRIAN PERIOD (300-30 B.C.)—In this age the spontaneous production of literature ceases and in its stead arise science and criticism, for the enlargement of the Greek world by the conquests of Alexander rendered the appeal to the learned few rather than to the masses inevitable. Prose becomes now more important than poetry, which is mostly learned and highly artificial. Ideality and art are gone; imitation and science have come in. Alexandria as a centre of literary activity rivals Athens. The following departments were cultivated:

1. *Poetry*.—Besides the new comedy, the most important is the pastoral poetry, the only new style, cultivated by Theocritus (270 B.C.) of Syracuse. His poems, called idylls, deal with the rustic life. The dialect is Dorian and the metre is hexameter. Theocritus is largely artificial and conventional, but exhibits true emotion and a deep feeling for nature. Thirty-one idylls are extant besides some epigrams and fragments. Bion (260 B.C.) of Ionia, and Moschus (c. 150 B.C.) of Syracuse, also cultivated pastoral poetry with considerable success. Here may also be mentioned Herondas (250 B.C.), whose recently discovered poems, called 'Mimiambi' (sketches of daily life), were published in 1891. Learned poetry was represented by Callimachus (260 B.C.), of whom we have six hymns and some epigrams, but only fragments of his elegies. Apollonius Rhodius (194 B.C.), a grammarian, wrote an epic on Jason, called 'Argonautica,' in imitation of Homer, but it is highly artificial. Lycophron (260 B.C.) cultivated tragedy. In didactic poetry Aratus (270 B.C.) wrote a poem on astronomy, which has little merit, and Nicander (150 B.C.) wrote a medical treatise in verse. Nicander also wrote 'Georgics,' which had some influence on Vergil, and 'Metamorphoses,' which were used by Ovid. Parody and satire also flourished in the hands of Timon (280 B.C.) of Phlius, whose satiric poems are called 'Silloi.'

2. *Philosophy*.—The old philosophy was gone and in its stead we find Stoicism and Epicureanism (qq.v.). Here may be mentioned Theophrastus (374-287 B.C.), whose work on 'Characters' is still extant, and Chrysippus, the Stoic.

3. *Philology and Criticism*.—The establishment of the Museum by Ptolemy I. gave great impetus to philological and critical study. Zenodotus (280 B.C.), who began the work of revising and explaining the Greek poets, wrote memoirs and lists of rare words and phrases. Aristophanes (200 B.C.) of Byzantium, who introduced the signs used to mark accents, and Aristarchus (150 B.C.), the text critic, were the greatest of the Alexandrian scholars. The science of grammar was now established. Apollodorus (140 B.C.) wrote a work on Mythology. Dionysius Thrax (110 B.C.) wrote the first grammar, which was used as a text-book as late as the 12th century.

4. *Science*.—Some advance had been made in

astronomy, mathematics, and geography, when Euclid (300 B.C.) gave to the world his 'Elements of Geometry,' which is still a famous work. Archimedes (d. 212 B.C.), who invented the screw, was a distinguished scientist, as was also Apollonius. Eratosthenes (d. 194 B.C.) founded scientific geography and chronology. Here we may mention Hipparchus (160 B.C.), the founder of scientific astronomy, and also the Athenian philosophers, especially the Peripatetics, who busied themselves with science.

5. *History*.—History was but sparingly cultivated, its greatest representative being Polybius (204-122 B.C.). His work was a record of Roman conquests in 40 books, of which we have the first five entire and fragments of the remaining.

III. ROMAN PERIOD.—In this period Greek literature spread over the civilized world. Incipient universities sprang up in different places and with them the striving after form and style, especially in prose, poetry being practically neglected.

1. *History* was cultivated in the early part of this period by Diodorus Siculus (b. 40 B.C.), who wrote a history of the world in 40 books, of which only books I-V and XI-XX with some fragments are preserved. Dionysius of Halicarnassus (d. 7 B.C.), of whose Archæology (or Roman History) books I-X have reached us, is much better known by his rhetorical works and critical essays on the classic prose writers. We may also mention in this department Josephus (37 A.D.), who wrote a history of the Jews, Arrian (100 A.D.), who wrote the history of Alexander's expedition and of India, and Dio Cassius, Appian, and Herodian, who wrote histories of Rome.

2. *Biography* was especially cultivated by Plutarch (40 A.D.), whose 'Parallel Lives' and ethical works have come down to us. Diogenes Laërtius, Flavius Philostratus, and Apollonius of Tyana, were also composers of lives.

3. *Geography* was represented by Strabo (18 A.D.) in 17 books, and Pausanias (160 A.D.), whose description of Greece is of the highest value. We may also mention Ptolemy (160 A.D.) of Alexandria, whose geography, based on mathematical and astronomical principles, held its own till replaced by the Copernican System.

4. *Learning* was studied by Julius Pollux, and Phrynichus, the Atticists, and by the grammarians Apollonius Dyscolus and his son Herodian. Athenæus (190 A.D.) is especially known for his 'Deipnosophistæ,' or 'Table Talk,' which is very dry, but has a wide range and contains valuable material. Galen (160 A.D.), besides his medical work, wrote on Plato and Hippocrates. Polyænus (170 A.D.) and Ælian (220 A.D.) have left us collections of anecdotes.

5. *Rhetoric* was systematized by Hermogenes (170 A.D.). It was also cultivated by Longinus (c. 213 A.D.), to whom is ascribed the work 'On the Sublime,' Dio Chrysostom (c. 50 A.D.), and others. Especially worthy of mention is Lucian (160 A.D.), the satirist and rhetorician, whose works are of varied interest and constitute the best prose since the decline.

6. *Philosophy* was little cultivated. We may mention Epictetus and Marcus Aurelius, the Stoics and Moralists, Plotinus and Porphyry, the Neo-Platonists, and Sextus Empiricus, the skeptic.

CLASSICAL LITERATURE

7. *Poetry* was practically neglected. The only name worthy of mention is Babrius (40 A.D.), who put the fables ascribed to Æsop into choliambic verse.

8. Here may also be mentioned the Christian writers, Justin Martyr (c. 105 A.D.), Clement of Alexandria (c. 150 A.D.) and his pupil, Origen (c. 185 A.D.), who wrote in the Greek spirit for the advancement of Christian truth.

IV. BYZANTINE PERIOD.—There is little to notice here. Poetry and Rhetoric are still cultivated slightly, but there is no creative faculty. Even the learning of the former age is dying out. It is the age of compilations, selections, anthologies. We have the novelist Heliodorus (390 A.D.) with his followers, Achilles Tatius and Chariton. In poetry only Nonnus's (c. 400 A.D.?) 'The Adventures of Dionysus' and Quintus Smyrnaeus's 'Sequel to the Iliad' are worth mentioning. Well known is Stobæus's 'Florilegium and Eclogæ' and the 'Anthology of Cephalas,' now called 'Palatine.' Libanius gives some interesting features of university life. Learning is represented by Chærobiscus, the grammarian, Eustathius, the commentator of Homer, Photius, Hesychius and Suidas, the lexicographers. Zosimus, Procopius, and Zonaras cultivated history. The most important of the Christian writers are Eusebius, Gregory, and Chrysostom.

ROMAN LITERATURE.

The Romans were an intensely practical people, endowed with less imagination and less creative power than the Greeks, and also lacked their fine feeling for the beautiful. Hence their literature does not have the same freshness and originality, though it is not less important, for through Cicero the prose style of Isocrates was transmitted to modern literature, and their laws live in many modern constitutions. The literary activity of the Romans may be divided into five periods: (1) Pre-Historic; (2) Archaic from Livius Andronicus to Cicero (240-70 B.C.); (3) The Golden or Classical (70 B.C. to 14 A.D.), embracing the Ciceronian and Augustan Periods; (4) The Silver Age (14-117 A.D.); (5) The Period of Decline (117-500 A.D.).

I. THE PRE-HISTORIC PERIOD.—The beginnings of Roman Literature were poetic and we find here carmina or songs on historical subjects, hymns to the dead, sacred songs, etc., composed in the Saturnian metre, and some epitaphs. The beginnings of drama are seen in the farce plays, 'Fescennini,' 'Satura,' 'Atellana.' Prose was confined to treaties, annals, laws, of which latter we may mention the 'Leges XII Tabularum,' which were committed to memory as the commandments. The only prose writer of this period was Appius Claudius Cæcus, whose speech against Pyrrhus was long extant.

II. THE ARCHAIC PERIOD.—Historic Roman Literature begins with Livius Andronicus (284-204 B.C.), who besides making a dull and dry translation of the 'Odyssey,' wrote comedies and tragedies based on the Greek. Cn. Nævius (264-194 B.C.) also wrote plays and an epic poem on the First Punic War, still using the Saturnian metre but showing more skill and originality than Livius Andronicus. The most important comedian of all is T. Maccius Plautus (254-184 B.C.), to whom about 130 plays are ascribed. Of these Varro selected about 31 as genuine and probably 19 others are genuine. Of the plays selected by Varro as genuine, 20 are still extant

and considerable fragments of the 21st, the 'Vidularia.' Plautus's plays are all based on the Greek. He shows great ability in working out the plots, handles his metres freely, but skilfully, and is a perfect master of the popular speech. His dialogue is bright and lively, full of rude wit and keen humor. His plays were long exhibited on the stage and studied in the schools and have been widely imitated in modern times. P. Terentius (185-159 B.C.) was brought as a slave to Rome, where he was liberated. His intimacy with Scipio Africanus and Caius Lælius gave rise to the belief that Scipio was the author of his plays. Six plays are extant, which are mostly imitated from Menander. Terence has neither the luxuriant genius nor the creative ability of Plautus, and lacks his pungent wit, but he is more reflective, more melodious, more artistic. His language is that of the best cultivated circles, and possesses elegance and grace. He was greatly admired by later Romans, and like Plautus has been a model for modern dramatists. Here may also be mentioned Statius Cæcilius, who imitated the new comedy of the Greeks, and Luscius Lanuvinus, the enemy and rival of Terence. The Fabula Togata or national comedy found its chief representative in L. Afranius (c. 150 B.C.), a man of considerable ability. Tragedy was cultivated especially by M. Pacuvius (220-132 B.C.), of whose 13 plays we have only fragments, and L. Accius (170-94 B.C.), who wrote about 40 tragedies. He was greatly admired by Cicero, Horace, and others. Besides Livius Andronicus and Cn. Nævius, already mentioned, the epic was treated by Q. Ennius (239-169 B.C.), who far outshone the others and may be called with Horace "Father Ennius," as the real founder of Latin poetry. His great work, besides comedies, tragedies, saturæ, was the 'Annales' in 18 books, of which only fragments are preserved. His verse is often rude and forced, but he was a man of talent, possessing a vivid imagination and great skill in handling the language. He introduced the hexameter verse to take the place of the Saturnian, and his work marks an epoch in the language changes produced. He was greatly admired by Cicero, who was fond of quoting him. Ennius also wrote Saturæ, but he was surpassed in this by C. Lucilius (150-103 B.C.), whose verse was rude and unfinished, but full of keen wit and searching criticism of public men and public affairs. Lucilius deserves special mention for giving the satura the nature of an invective poem. About 900 fragments are preserved.

Before prose was sufficiently developed, the early historians, especially Q. Fabius Pictor (c. 210 B.C.) and L. Cinnius Alimentus (c. 209 B.C.), used the Greek tongue. The real founder of Latin prose is M. Porcius Cato (234-149 B.C.), a voluminous writer on many subjects. His works comprise 'Origines' in seven books, on the rise and growth of Rome and the origin of Italian cities, 'De Re Rustica,' still extant, and many speeches. Among other historians may be mentioned S. Cornelius Sisenna (119-67 B.C.), Claudius Quadrigarius, Velerius Antias, and Licinius Macer, whose work was much used by Livy. In oratory, besides Cato, we find S. Sulpicius Galba, C. Gracchus, M. Antonius, L. Crassus, Q. Fabius Maximus, M. Cornelius Cethegus, and Q. Hortensius (114-50 B.C.), who was the bridge between these orators and

CLASSICAL LITERATURE

Cicero. Also worthy of mention are S. Ælius Pætus, who wrote the first law book, 'Tripertita,' and L. Ælius Stilo, the first philologist. The 'Rhetorica ad Herennium,' in four books, an important work on rhetoric, also belongs to this period. Its author is unknown, but it does not belong to Cicero or Cornificius, to each of whom it has been ascribed.

III. GOLDEN OR CLASSICAL PERIOD.—This period contains the best of Roman literature and may for convenience be divided into the Ciceronian and Augustan ages, the former being characterized by the highest development of prose, the latter of poetry.

(a) *The Ciceronian Period.*—The first great writer of this age is M. Terentius Varro (116-28 B.C.), of ancient family and high rank, who was the most learned man and most extensive writer of ancient Rome. In his works, 74 in number, in more than 600 volumes, he treated almost every conceivable subject, literature, oratory, history, philosophy, grammar, jurisprudence, geography, agriculture, etc. Of especial importance are his *Saturæ Menippeæ*, in which he used both prose and verse form to satirize the condition of his times. By far the greatest name in Roman literature is M. Tullius Cicero (106-43 B.C.), the son of a Roman knight, born near Arpinum in Latium. He was remarkably endowed both physically and mentally. He was tall and commanding in appearance, possessed of a fine memory, vivid imagination, quick and ready wit, intense feeling, and a kindly, generous disposition. To these natural gifts he brought the most untiring energy in his eager acquirement of knowledge of every kind and enjoyed the instruction of the very best masters. He was an intense and honest patriot, but lacked political sagacity and the courage of his convictions. His appreciation of the beautiful, supplemented by his study of the Greek writers, led him to reproduce their thoughts in Latin, and thus he became the founder of the finest prose that ever was known to the Romans. His highest achievement was in oratory, and his speeches, both political and legal, are among the finest remains of Roman literature. His correspondence was prolific and is of immense value from an historical as well as from a linguistic point of view. In his later years, when the party of Cæsar was in the ascendancy, he retired to private life and composed his philosophical works, largely as a solace for his troubles, but also to acquaint his people with the best systems of the Greeks. Of over 100 speeches we have 57 complete, and fragments of about 70 others, while the rest are known to us only by tradition. The greatest speeches are the four against Catiline, one for Milo, one against Verres, and the second against Antony, one of the most powerful invectives in any language. His rhetorical works are an outgrowth of his preparation for oratory. In this work his aim was to modify and fit existing systems to Roman needs. The rhetorical works are as follows: 'De Inventione,' in two books, very crude and immature; 'De Oratore,' in three books, in dialogue form, with the two great orators, L. Crassus and M. Antonius, as the chief speakers, a splendid work, full of vivacity and eloquence and composed in magnificent style; 'Brutus, sive de Claris Oratoribus,' also in dialogue form, a history of Roman oratory. In the 'Orator ad M. Brutum,'

Cicero paints his ideal orator. In the 'Partitiones Oratoriæ,' didactic in nature, Cicero quizzes his son on rhetorical matters. 'Topica ad C. Trebatium' is an explanation from memory of Aristotle's 'Topica.' 'De Optimo Genere Oratorum' is a discourse on the Asiatic and Attic styles of oratory, being an introduction to his translation of the two famous speeches of Æschines and Demosthenes 'On the Crown,' which translation is, however, unfortunately lost. Philosophy was not kindly received at Rome, and while Ennius and others had treated it slightly, it remained for Cicero to transplant it and settle it firmly on Roman soil. In philosophy Cicero was an eclectic, being almost wholly dependent on the Greek thinkers, so that his philosophical works are important more for their elegance of composition and beautiful style than for their matter, though this is important too, as it often deals with systems of philosophy otherwise unknown to us. His philosophical works are: 'De Republica,' a treatise on government in six books, of which only about a third is preserved; 'De Legibus,' also incomplete and probably originally in six books; it is a treatise on church and state law; 'Paradoxa' is an explanation of Stoic principles; 'Consolatio,' of which only fragments exist, was occasioned by his daughter's death; 'Hortensius,' also fragmentary, recommends the study of philosophy; 'De Finibus Bonorum et Malorum,' in five books, is an exposition and criticism of the Highest Good and Evil as taught by the Greek philosophers; 'Academica,' in two editions, of which the first, Lucullus, is extant, the last, Varro, only in fragments, is an exposition of the doctrines of the Academy; 'Tusculanæ Disputationes,' in five books, discusses matters pertaining to a happy life; 'Timæus,' a fragment, is a free translation of Plato's dialogue of the same name; 'De Natura Deorum,' in three books, deals with the Deity and his relation to the world; 'De Divinatione,' in two books, on the doctrine of soothsaying, with arguments against it; 'Cato Maior, sive De Senectute,' a delightful essay on old age, containing an outline of Cato's character, cheerful in tone and finished in style; 'De Fato,' a fragment, against the Stoic doctrine of Fate; 'Lælius, sive De Amicitia,' another charming essay on Friendship, written in vivid style and choice language; 'De Officiis,' in three books, is a system of ethics addressed to his son; 'De Gloria,' 'De Virtutibus,' and 'De Auguriis,' with translations from Xenophon and Plato are now lost. Cicero also wrote 'De Iure' and composed the history of his consulship, which are also lost. His two poetic efforts, 'De suo Consulatu' and 'De Temporibus Suis' were very unfortunate and subjected him to considerable ridicule. Cicero greatly dignified the art of letter-writing, and his letters, written in a graceful, conversational style, are a perfect storehouse of information for the history of his times. We possess in all 864 letters (including 90 addressed to Cicero) distributed as follows: 'Ad Familiares,' 16 books; 'Ad Atticum,' 16 books; 'Ad Quintum Fratrem,' 3 books; 'Ad Brutum,' 2 books, the genuineness of the latter being vigorously disputed and defended by many scholars. Coequal with Cicero as a writer was the great Julius Cæsar (100-44 B.C.), a man distinguished in many departments of life, being a great statesman, general, orator, historian, and grammarian.

CLASSICAL LITERATURE

His chief literary works that have reached us are: 'Commentarii de Bello Gallico,' in 7 books, and 'De Bello Civili,' in 3 books, written in elegant, simple, and clear style. The eighth book 'de Bello Gallico' was written by A. Hirtius as was the 'Bellum Alexandrinum,' but the 'Bellum Africum' and the 'Bellum Hispaniense' are by unknown hands. Cornelius Nepos (99-24 B.C.), the friend of Catullus, Cicero, and Atticus, was the author of many works, of which only a part of the 'De Illustribus Viris' is extant, written in an easy, but often monotonous and impure style. Caius Sallustius Crispus (86-34 B.C.), the enemy of Cicero and Pompey, was the first to treat historical writing as an art, and took for his model Thucydides. Of his works, the 'De Coniuratione Catilinæ' and the 'Bellum Iugurthinum' have reached us entire, but of the histories, in five books, we have only fragments. Sallust's style is very concise and his language is artificial and archaic, and, though sometimes obscure, it is extremely forcible and vivid. Poetry in this period was cultivated by T. Lucretius Carus (96-55 B.C.), who wrote a didactic poem in six books, 'De Rerum Natura,' in which he tried to free the mind from all kinds of superstition by a rational study of nature, basing his work on the philosophy of Epicurus. Lucretius was a masterful genius with great poetic instinct and independent spirit. On account of the poverty of the language in philosophical expression, the archaic style of the poem, and the dry and abstruse subject-matter, it is often difficult to understand. Horace and Ovid were greatly influenced by him. The greatest poet of the period, and perhaps the greatest Rome ever produced, was C. Valerius Catullus (87-53 B.C.), the lyricist, from whom we have 116 poems on various subjects in various and sometimes rare metres. Catullus, impulsive and frank by nature, is pre-eminently the poet of passion, showing his best work in his short love songs, which are written in splendid, but simple and chaste style.

(b) *The Augustan Period.*—P. Vergilius Maro (70-19 B.C.), the greatest epic writer of Rome, enjoyed the highest educational advantages, was gentle and pure, amiable, bashful, not a genius, but a slow, laborious worker, carefully polishing all he wrote. His extant poems are: 'Bucolics,' or 'Eclogæ,' 10 in number, which are imitations of Theocritus; 'Georgica,' in four books, in which he followed Hesiod, Aratus, and others as models, though great independence is shown, as the subject was congenial to his personal taste and experience. The warmth and vividness, skilful use of language and pleasing arrangement of the episodes make these the most artistically perfect of all the Roman poems that have reached us. The 'Æneis,' in 12 books, never received the poet's finishing touch, so that he wished it to be destroyed. This masterly poem, one of the greatest epics of the world, treats of the adventures of Æneas, the 'Odyssey' being the model for the first six books, the 'Iliad' for the last six. The language is elegant and at times sublime, but it lacks the simplicity of the Homeric poems. Besides these, several minor poems are perhaps wrongly attributed to Vergil. Q. Horatius Flaccus (65-8 B.C.), the most popular poet of Rome, brought the satire to its highest perfection. We have two books of satire, the former containing ten, the latter, eight poems, of which the subject-

matter is varied, the tone good-natured, though at times sharp, and the style easy and conversational. At about the same time and in like tone, were produced the Epodes, which, like the Odes in form, are like the Satires in contents, though more specific and less generous. The Odes, by which Horace is probably best known, and which are based on Greek models, especially Alcæus, Sappho, and Anacreon, though not wholly dependent on them, are elaborately wrought out, showing much warmth of feeling, but little of passion and imagination. The skilfully handled metres, the well chosen language as well as the artistic and happy setting, make the Odes the delight of all. In his later years, he produced the Epistles in two books, of which the first has twenty, the latter, three poems. These are of the same general character with the Satires, but show greater care and better style. Especially famous is the third epistle of the second book, called by Quintilian "Liber de Arte Poetica," in which Horace discusses with fine taste a series of literary questions. Albius Tibullus (c. 54-19 B.C.), the Roman elegiac poet, was passionate in nature, warm and sympathetic. Four books of elegies are ascribed to him, of which the third and part of the fourth are spurious. They show a refined taste, great felicity of expression, and smoothness of metre. Sextus Propertius (c. 50-15 B.C.), a younger contemporary of Tibullus, also wrote elegies, of which we have five books. He was sensuous and passionate by nature, full of fire and originality, but often obscure and difficult on account of the multitude of mythological allusions. P. Ovidius Naso (48 B.C.-17 A.D.) was a man of vivid imagination and high poetic temperament, but frivolous and self-indulgent. He was a wonderful story-teller, and the elegance and grace of expression combined with the easy and skilful handling of the metres constitute Ovid's peculiar charm, but these very gifts of nature prevent him from taking the highest rank, for the labor of polishing was irksome to him. We have the following poems: 'Epistolæ' (or 'Heroides'), 21 imaginary love letters by men and women in the heroic age, in elegiac metre; 'Amores,' in three books, chiefly erotic; 'Ars Amatoria,' in three books, and the 'Remedia Amoris,' in two books, its counterpart; 'Medicamina faciei,' only partly extant; 'Metamorphoseon Libri XV,' in hexameter verse, treats of various myths and their sources after Greek models; 'Fastorum Libri VI' is a calendar, with an account of the origin of Roman festivals; 'Tristium Libri V' recounts the troubles of his journey and his wretched plight in a strange land; 'Epistularum ex Ponto Libri IV' are of a like nature and the 'Ibis,' a very abusive poem against some unknown enemy, and finally the 'Halieutica,' a didactic poem, in hexameters, of which only 132 lines are preserved, treating of the fish in the Black Sea. Here may also be mentioned Græcius Faliscus, whose 'Cynegetica' is in a very imperfect state, and Manilius, whose work on astronomy (or better astrology) is dry but not without interest. The greatest prose writer of this age was T. Livius (59 B.C.-17 A.D.) of Patavium, a man of vivid imagination, generous feelings, possessed with a love of truth, and gifted with fine oratorical powers. His language, graceful and elegant, is made more charming by the archaisms and poetic coloring. Livy is a fine

CLASSICAL LITERATURE

master in the portrayal of character and is perhaps the greatest stylist of the Romans. The charge of provincialism is hardly if at all discernible to us. Besides his philosophical and rhetorical works, which are now lost, he wrote the history of Rome in 142 books, 'Ab Urbe Condita,' of which books I-X and XXI-XLV are preserved, while of the rest we have epitomæ, a very unsatisfactory substitute. Other prose writers of this period are Annæus Seneca (c. 54 B.C.-36 A.D.), a writer on rhetorical subjects, Pomponius Trogus, who wrote a universal history in 44 books, of which a compendium was made by Justinus, and Vitruvius Pollio, from whom we have 'De Architectura Libri X.' In law, we may mention S. Sulpicius Rufus, A. Ofilius, M. Antonius Labes and C. Ateius Capito. In grammar and philology, P. Nigidius Figulus, who, besides his work on theology and natural sciences, wrote 30 books, 'Commentarii Grammatici;' M. Verrius Flaccus author of 'Fasti' and 'De Verborum Significatu,' and Iulius Hyginus, who wrote on history, geography, agriculture, astronomy, etc., commentaries on Vergil and 277 fables.

IV. SILVER AGE.—C. Velleius Paterculus (18 B.C.-31 A.D.), the court historian under Tiberius, wrote an 'Abridgment of Roman History,' in two books, classical in vocabulary, but exaggerated and artificial in style. Valerius Maximus (fl. A.D. 26) was not an historian, but a compiler, and his 'Factorum et Dictorum Memorabilium Libri IX,' without taste and sometimes without sense, seems to be a collection of models for rhetoricians. Much more important is A. Cornelius Celsus (fl. A.D. 50), the scientist, of whose encyclopædia we have still extant the eight books on medicine. Here also belongs Phædrus, whose 92 fables in imitation of Æsop are good both as to metre and style. By far the most important writer of this time is L. Annæus Seneca (4 B.C.-65 A.D.), poet and philosopher, who wrote on numerous subjects in a striking and brilliant, but highly artificial style. Besides many works known only by name, we have 'Dialogi XII,' on various topics; 'De Beneficiis,' in four books; 'Naturales Quæstiones,' in seven books; 'De Clementia,' in two books, and 'Apolocynosis,' a bitter satire on the emperor Claudius, and 'Epistolæ Morales ad Lucilium,' 124 letters on moral subjects, abounding in saws and maxims. The correspondence with Saint Paul is spurious, but there is now little doubt that the tragedies ascribed to him are genuine. Q. Curtius Rufus (fl. A.D. 50) wrote 'Historiæ Alexandri Magni Libri X,' of which books I and II are lost, not a great work, though at times vivid and dramatic, resembling Livy in the words and phraseology, but Seneca in the form of the sentences. Here may also be mentioned M. Columella, whose work, 'De Re Rustica Libri XII,' shows considerable technical knowledge and good taste, and Pomponius Mela, whose 'De Situ Urbis,' in three books, reflects Seneca's style. A. Persius Flaccus (34-62 A.D.), the Stoic, whose six satires have been much admired on account of their ethical value. M. Annæus Lucanus (39-65 A.D.) wrote numerous poems, of which only 10 books of the 'Pharsalia' have reached us. This work has some fine passages, but the style is highly artificial like Seneca's, his uncle. To Petronius Arbiter is ascribed the satirical novel, originally in 20 books, of which only fragments

are now extant, and of these the 'Cena Trimalchionis,' a coarse, but witty description of a banquet given by a rich upstart. C. Plinius Secundus, Pliny the Elder (23-79 A.D.), a naval officer, wrote on history, tactics, grammar, rhetoric, etc., but the only work that we have is his 'Naturalis Historia,' in 37 books, which is a compilation from numerous works, rich in learning, but dry and often crude in style. C. Valerius Flaccus, under Vespasian, wrote 'Argonautica,' in eight books, after the manner of Apollonius Rhodius, in a highly artificial and rhetorical style, which is often obscure. C. Silius Italicus (25-101 A.D.), under Domitian, wrote 'Punica,' in 17 books, on the Second Punic War, imitating Livy in matter and Vergil in style. From P. Papinius Statius (45-96 A.D.) we have the incomplete poem, 'Achilleis,' in one and a half books, 'Thebais,' in a highly florid and artificial style, rich in mythological lore, and the 'Silvæ,' in five books, consisting of 32 pieces, in various metres, and of much greater interest than the two preceding poems. Of M. Valerius Martialis (c. 40-120 A.D.) we have 1,555 epigrams, in various metres, full of wit and scathing sarcasm, but often coarse and obscene. M. Fabius Quintilianus (35-95 A.D.), the great teacher of rhetoric, has always enjoyed a wide reputation. The only work that has come to us is his 'Institutio Oratoria,' in 12 books, outlining the complete course for instructing an orator, making an interesting and valuable book. Quintilian's aim was to bring back the old style, especially Cicero's, and though he condemns in vigorous language the artificial style of his day, especially of Seneca, the philosopher, he was unable to free himself entirely from the stylistic defects of his age. Sextus Iulius Frontinus (40-103 A.D.) was a distinguished mathematical writer, of whose work on 'Surveying' only extracts are extant; we also have his 'Strategemata,' in three books, and 'De Aquis Urbis Romæ,' valuable for the information it contains. The greatest poet of the period is Dec. Iunius Iuvenalis (56-140 A.D.), of whom we have 16 satires in five books, in which he satirizes the hideous vices of his time in a most interesting and realistic manner. His language is forcible and drastic, though often obscure. The most distinguished prose writer of the decline is P. Cornelius Tacitus (55-119 A.D.), whose extant works are as follows: 'Dialogus de Oratoribus,' considered doubtful by some on account of its diffuse and florid style; 'Agricola,' a very valuable and sympathetic biography of his father-in-law, in rhetorical style; 'Germania,' an historical monograph, also in rhetorical style, a valuable contribution to our knowledge of the ancient Germans; 'Historiæ,' originally in 14 books of which only I-IV and the first part of V are extant, contains an account of the Flavian dynasty; 'Annales,' or more correctly 'Ab Excessu Divi Augusti Liber,' originally in 16 books, of which only I-IV and XII-XV are extant entire, and parts of V, VI, XI, and XVI, which treat of the Julian dynasty. Tacitus was an earnest and conscientious historian, a careful student of his authorities, and tried to be impartial. He shows the influence of Cicero and Sallust in his style, which is now grave and compact, now sonorous and grand, very irregular at times, but always energetic. A charming writer of this time is C. Plinius Cæcilius Secundus (62-113 A.D.), Pliny the

CLASSICAL LITERATURE—CLAUDE LORRAINE

Younger, nephew and adopted son of Pliny the Elder. He was a distinguished advocate and speaker of his day. Of his speeches we have the 'Panegyricus,' in which he thanks Trajan for the consulship. Far more delightful and interesting are his 'Epistolæ,' in nine books, written with a view to publication and so lacking the freshness of Cicero's letters, but forming a valuable help to understanding the temper and condition of his times; a tenth book contains the correspondence between Pliny and Trajan, when Pliny was governor of Bithynia. The style is smooth, equable, and fluent.

V. PERIOD OF DECLINE.—The most important writer of this age is Suetonius, whose 'Lives of the Twelve Cæsars' and some fragments of his other works have come down to us. Here also belongs Florus, with his tasteless 'Epitome of Roman History,' the grammarian Terentius Scaurus, Fronto, the rhetorician; the jurists Ulpian, Marcellus, and Gaius, Aulus Gellius, whose 'Noctes Atticæ' contain valuable material; Apuleius, a voluminous writer of prose and verse, whose 'Metamorphoseon Libri XI' is best known; the Christian writers Minucius Felix, who imitated Cicero and Seneca, and Tertullianus, author of the 'Apologeticus,' and the grammarians, Acron and Porphyrius, authors of commentaries on the classic poets, and Terentianus Maurus, the metrician. In the 3d century we find Ulpianus and Paulus, the jurists, Cyprianus, Arnobius, and Lactantius, the Christian writers, of whom the last is the Cicero of the Christian writers; and Nonius Marcellus, the lexicographer. In the 4th century worthy of mention are the grammarians and commentators, Victorinus, Donatus, and Servius, Eutropius and Ammianus Marcellinus, the historians; the poets, Ausonius and Prudentius, a Christian poet; Damasus and Ambrosius, writers of Christian hymns, and Claudius, a brilliant poet for his time; and the Christian writers, Hieronymus (Saint Jerome), who translated the Bible, and Augustinus (Saint Augustine), the best of the late Christian writers. With these it is perhaps best to close this sketch of Roman literature, though the writing of Latin continued for many centuries after these.

See also DRAMA; LITERATURE; POETRY; LATIN LITERATURE.

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Claude, Jean, zhõn klõd, French Protestant theologian: b. La Sauvetat, near Agen, 1619; d. The Hague 13 Jan. 1687. He officiated as pastor at Nîmes and Montpellier, but owing to his opposition to the government scheme for the reunion of the Protestants and Roman Catholics, was interdicted from preaching. The controversial abilities of Claude rendered him formidable and obnoxious to the Catholic party. On the very morning on which the revocation of the edict of Nantes was registered at Paris, he was ordered to leave France within 24 hours. He retired to Holland, where he was received by the Prince of Orange, who settled a pension upon him. The most important of his works is his 'Défense de la réformation' (1673). He also published a well-known 'Essay on the Composition of a Sermon.' He wrote against Arnauld and Nicole on the doctrine of transubstantiation, and in 1678 held a discussion with Bossuet in presence of Mlle. de Duras, a Protestant lady connected with the court, and niece of Turenne, who wished to review the grounds of her faith by hearing their arguments. Bossuet published an account of the conference, which was answered by Claude.

Claude Lorraine, klõd lõr räñ, or **Lorrain,** so-called, French landscape painter: b. Chamagne, Vosges, France, 1600; d. Rome 21 Nov. 1682. His real name was CLAUDE GELLÉE: he was called *Lorraine* from the province of this name, where he was born. When 12 years old it is said he went to live with his brother, an engraver in wood, at Freiburg. Afterward a relation of his took him to Rome, where the sight of some paintings of Gottfried Wals enchanted him so much that he traveled to Naples to study with the artist. Returning to Rome after two years, he was employed by the landscape-painter Agostino Tassi, as a color-grinder and otherwise. He is next said to have studied, in Lombardy, the paintings of Giorgione and Titian, whereby his coloring and chiaroscuro were greatly improved. After making a journey into his native country, and residing for some time at Nancy, he settled in 1627 in Rome. Here he attracted the notice of Cardinal Bentivoglio, and was introduced by him to Pope Urban VIII., who gave him orders for four paintings. His position being now assured, he had many other eminent patrons, and was enabled to live much at his ease. The

CLAUDIAN — CLAUDIUS

principal galleries of England, France, Spain, Russia, and Germany are adorned with his productions. The public and private galleries of England are richest in these works, a number being in the National Gallery, others at Dulwich, at Windsor Castle, and elsewhere. Claude possessed the greatest power of invention, by which he gave an inexhaustible variety to his paintings, united with an ardent and persevering study of nature. The truth with which he portrays the effect of the sun in every part of the day, soft breezes playing through the tops of the trees, and all the delicate beauties of nature, is surprising; and all his rivals fell far short of equalling the dewy humidity which he threw over dark, shadowy places. His figures are poor, and he used to say — "I sell my landscapes, and give my figures into the bargain." In a great number of his paintings the figures are the work of other artists. Claude most frequently chooses views in which the eye loses itself in agreeable prospects, without being able to define their limits. He often introduces grand architectural structures, and makes his landscapes the scenes of mythological and historical events. Claude himself made a collection of some 200 drawings of his pictures. This record, now in the collection of the Duke of Devonshire, is known as the 'Liber Veritatis.' Consult Lady Dilke, 'Claude Lorrain, sa Vie et ses Œuvres' (1884); Dullea, 'Claude Gellée, le Lorrain' (1887).

Claudian. See CLAUDIANUS.

Claudianus, klâ-dī-ā'nūs, **Claudius** (commonly known as **Claudian**), Roman poet: b. Alexandria about 365 A.D.; d. about 408. He went to Rome in 395 A.D., where his poems gained him such renown that a statue was erected to his honor in the forum of Trajan. Besides several panegyric poems on Honorius, Stilicho, and others, we possess his epic, the 'Rape of Proserpine,' an unfinished Gigantomachia, idyls, epigrams, epistles, and occasional poems. Claudian, whose native tongue was Greek, possessed a remarkable command of the Latin language, and displays poetic powers of a high character, brilliancy of diction, truth of description, and richness of illustration. The best editions of his works are those of Gesner (1759); Burmann (1760); Jeep (1876-9); Koch (1893). There is a metrical translation of his works by A. Hawkins (1817).

Clau'dius, klâ'dī-ūs, the name of a distinguished Roman family which under its head, Attus Clausus, a Sabine, settled at Rome about 504 B.C., and soon branched off into a patrician and a plebeian stock. Attus, admitted among the patricians, changed his name to Appius Claudius. The patrician Claudii were characterized throughout their whole history by their haughty and tyrannical bearing, displayed particularly toward the plebeians; while the plebeian branch were equally distinguished for the resolute assertion of the rights of their order. The patrician Claudii counted among their members 28 consuls, 5 dictators, 7 censors, etc. The plebeian form of the name was Clodius, and the most distinguished members of the plebeian branch bore the cognomen of Marcellus.

Clau'dius, or in full, **Tiberius Claudius Drusus Nero Germanicus**, 4th Roman emperor: b. Lyons, 10 B.C.; d. 54 A.D. He was the youngest son of the elder Claudius Drusus Nero

and Antonia the younger, the daughter of Augustus' sister. His early education was left to women and slaves; owing to his ill health it was thought he would never become a robust man. He lived as an unimportant private man, and occupied himself with literature. Among other works he wrote a Roman history, embracing the period from the death of Cæsar to his own time, in 43 volumes, and also his own life. After the murder of Caligula, the body-guard, who were ransacking the palace, discovered him secreted in a corner, dragged him out, and proclaimed him emperor (41 A.D.). The senate, who had determined on the restoration of the republic, were forced to confirm the appointment. Claudius, suddenly transferred from retirement and oppression to uncontrolled power, distinguished the beginning of his reign by some praiseworthy acts; he recalled the exiles and restored their estates to them; embellished Rome and erected several large buildings for the public good. He made Mauritania a Roman province; his armies fought successfully against the Germans, and kept possession of several strong places in Britain. But he sank into debauchery and voluptuousness; and his wives, particularly the infamous Messalina, together with his freedmen, administered the government, sold offices and places of honor, and committed the greatest atrocities unpunished. He died of poison administered by his fourth wife, Agrippina (mother of Nero), at the age of 63, 54 A.D. His deification was the cause of Seneca's pasquinade entitled 'Apocolocyntosis.'

Claudius II. (MARCUS AURELIUS FLAVIUS), surnamed GOTHICUS, Roman emperor: b. Illyria; d. 270 A.D. He was raised to the throne on the death of Gallienus, in 268, and by his virtues as well as his splendid victories over the Goths, he proved himself worthy of his exalted station.

Claudius, Appius, surnamed **Cæcus** ("the blind"), an ancient Roman, elected censor in 312 B.C., in which office he made himself notorious by his arbitrary proceedings, for the purpose of weakening the influence of the plebeians, by admitting into their number the sons and grandsons of freedmen, and others of the lowest of the people. He performed an important service, however, by the construction of the road and the aqueduct which bear his name, though he is said to have procured the removal of his colleagues from office that he might be able to appropriate the whole honor of these works to himself. Selfish ambition was the distinguishing feature in his character. In his old age he became blind; but when Cineas, the deputy of Pyrrhus (280 B.C.), had gained over the senate, which was on the point of accepting peace on the terms offered by him, Appius caused himself to be led into the senate-house, and in a celebrated speech, of which Cicero speaks in the highest terms, succeeded in persuading the senate to resolve that they would listen to no proposals of peace in which the evacuation of Italy was not made an essential condition. From his two sons spring the two best known branches of the Claudian family, the one distinguished by the surname of Pulcher, and the other by that of Nero.

Claudius, Matthias, mat-tē'äs klow'dī-ūs, German poet: b. Rheinfeld 15 Aug. 1740; d. Hamburg 21 Jan. 1815. His prose and poetry bear a peculiar stamp of humor, frankness, and

CLAUSEL — CLAVICLE

cordiality. In 1775 he made a collection of his compositions, which had appeared in the 'Wandsbeck Messenger' and other periodicals, with the addition of some which had not been printed, and gave the collection the title 'Asmus omnia sua Secum Portans,' or 'Complete Works of the Wandsbeck Messenger.' All his works are written in a natural, intelligible, and often humorous style, and support the cause of good morals, benevolence, patriotism, and piety, while they attack folly and vice with the weapons of ridicule and scorn. Many of his songs have been set to music by the first composers, and have become a part of the national melodies. He occupied several public offices. In the latter part of his life he became a convert to religious mysticism.

Clausel, Bertrand, bër-trän klō-zël, France, a marshal: b. Mirepoix 1773; d. 1842. After gaining a high reputation by his services on the Pyrenees, in Haiti, Italy, and Dalmatia, he accompanied Junot and Massena to Spain in 1810. He laid siege to Ciudad Rodrigo, and was wounded at Salamanca. By his skill and conduct the army of Portugal was preserved and led into Spain. In 1813 Napoleon rewarded his valor by conferring on him the chief command of the forces in the north of Spain. On the restoration of the Bourbons he came to the United States, and lived here for a long time in retirement, but when Charles X. was overthrown in 1830 he received from Louis Philippe the command of the French troops in Algeria, which he retained till 1836, when he resigned in consequence of the defeat he had sustained at Constantine.

Clausen, klow'sën, George, English artist: b. London 1852. After studying at South Kensington 1867-73, he was for some time in Paris under Bouguereau and Fleury and subsequently visited Holland and Belgium, exhibiting at the Royal Academy in 1876, 'High Mass at a Zuyder Zee Village.' Besides many paintings of Dutch themes he has painted among other works: 'Laborers at Dinner'; 'Brown Eyes'; 'Evening Song'; 'Turning the Plow.'

Clausewitz, klow'zë vīts, Karl von, Prussian military officer: b. Burg 1 June 1780; d. Breslau 16 Nov. 1831. He served with distinction in several campaigns in the Prussian and Russian services in 1815, became chief of a Prussian army corps, and was ultimately director of the army school, and inspector of artillery. Of his works the best known are his great book 'Of War' (3 vols.), and his life of Scharnhorst.

Clausius, klow'zë-üs, Rudolf, German physicist: b. Köslin, Pomerania, 2 Jan. 1822; d. Bonn 24 Aug. 1888. He studied at Berlin and afterward lectured on natural philosophy as *privat-docent* at Berlin, and as professor at the Zürich Polytechnic School. In 1869 he was appointed to the chair of Natural Philosophy at Bonn. He was elected a foreign member of the Royal Society in 1868, and in 1879 was given its highest honor, the Copley medal. His scientific labors cover parts of the field of optics and of electricity, but his especial work was his contribution to the science of thermo-dynamics, the honor of establishing which on a scientific basis he divides with Rankine and Thomson. His mathematical methods he also applied to the theory of the steam-engine, the dynamical or

kinetic theory of gases, and to electricity and electro-dynamics. His great work is his 'Theory of Thermo-Dynamics.'

Clausthal, klow's'täl, Prussia, a mining district and town in the province of Hanover. It is situated on the Zellerbach, 26 miles northeast of Göttingen. It stands in a bleak district, on the top and slopes of a hill, about 1,800 feet above the sea. It is regularly laid out, having been frequently burned down and rebuilt, but the houses are generally of wood. It contains a government mining school, with a good collection of models of mines and minerals, a library of 30,000 volumes, a mint at which 14,000 silver dollars are coined weekly, and over 600 gold ducats yearly, and it has also a church, court-house, and gymnasium. One of the mines reaches 500 feet below the level of the Baltic, and is drained by a tunnel cut through the mountain to a distance of six miles. The machinery of the mines is worked by water power, and every stream in the vicinity is carefully appropriated to this purpose; the various canals, which extend from mill to mill throughout the mines, have an aggregate length of 125 miles. These mines have been worked since the 11th century. The mines furnish employment to the men, and a number of knitting mills give employment to the women. Pop. 9,200.

Clava Coronæ, klā'va kō-rō'nē ("the Key of the Crown"), one of the names given to the star Alpha Coronæ Borealis, the brightest in the Northern Crown. The more common name is that of Arabic derivation, Alphecca.

Clavaria, klā-vā'rī a, a genus of fungi, many of them edible. Some of the species are branched, some club-shaped. One species (*C. botrytis*), growing in Germany, is a common article of food. It has a sweetish taste, and is said by Liebig to contain mannite (q.v.). Another species (*C. flava*) is used in the same way. Another species is the goat's-beard fungus.

Claverack, klāv'er-āk, N. Y., a town in Columbia County, on the Boston & A. R.R., about 28 miles south of Albany. The town was settled in 1660, and has a church building dating from 1767, and a court-house erected in 1784. The town is the seat of a well-known school called the Hudson River Institute, established in 1854. Pop. (1900) 4,416.

Claverhouse, klāv'er ūs. See GRAHAM, JOHN.

Clav'erings, The, a novel of contemporary English life, by Anthony Trollope, published 1867.

Clav'ichord, a keyed musical instrument, now out of use, somewhat in the form of a spinet, the strings of which are supported by five bridges. One distinction in the clavichord is that the strings are covered with pieces of cloth, which render the sound sweeter, and at the same time deaden it, so as to prevent its being heard at any considerable distance. On this account it was formerly much used by the nuns, who could practise on it without disturbing the dormitory. It is sometimes called the "dumb spinet." See PIANOFORTE.

Clav'icle, or Collar-bone, a bone situated immediately above the first rib, stretching from the upper border of the manubrium of the sternum, outward and backward to the acromium

process of the scapula or shoulder-blade. It connects the upper limb, the arm, with the trunk, and is so fastened that while its inner end rests on the sternum and cartilage of the first rib the outer end is associated with the scapula, supporting it firmly in its varied positions and preventing it from falling forward from the chest. The clavicle is a long bone, and in men is much heavier than in women. It is absent or imperfectly developed in those animals which do not use lateral movements of the fore-limbs and is very much exaggerated or modified in animals such as birds, that exercise the arms very extensively. The clavicle is very frequently broken in children from the results of a direct fall, and as it does not always occasion a marked deformity the diagnosis is at times difficult. Consult Morris, 'Human Anatomy,' 3d ed.; Gerrish, 'Text-Book of Anatomy by American Authors,' 2d ed.; Spalteholz, 'Anatomy.' See SHOULDER-JOINT.

Clavigero, Francisco Xavier Saverio, frän-thēs'kō hä-vē-ār' sä-vā-rē'ō klä-vē-hā'rō, Mexican historian: b. Vera Cruz, Mexico, about 1720; d. Cesena, Italy, 1787. He was educated as an ecclesiastic, and resided 36 years in the provinces of New Spain, where he acquired the languages of the Mexicans and other indigenous nations, collected many of their traditions, and studied their historical paintings and other monuments of antiquity. The first of his researches was a 'History of Mexico,' written in Italian, of which an English translation was published in 1787. This is a most comprehensive work, affording a great deal of information relative to the natural and civil history, antiquities, and religion of Mexico; but it displays more industry than judgment on the part of the author. On the suppression of the Jesuits by the Spanish government in 1767 Clavigero went to Italy, the Pope assigning him a residence in Cesena.

Clavijo y Fajardo, José, hō-sā' klä-vē'hō ē fä-här'dō, Spanish scholar: d. 1806. He lived in Madrid, where he had the reputation of an intelligent scholar, and had published a journal, 'El Pensador,' and other useful works, when his connection with the sister of Beaumarchais, whom he had loved and then forsaken, gave rise to an affair of honor between him and the brother of the lady, who was formidable for talent rather than courage. This affair, in which he narrowly escaped with his life, deprived him of his office and the good opinion of his fellow-citizens. He passed the remainder of his days under a kind of dishonor, which the representations of his adversary had brought upon him. For more than 20 years he superintended the publication of the 'Mercurio Histórico y Politico de Madrid,' with which he had been intrusted as early as 1773. He likewise translated Buffon's 'Natural History' into Spanish (1785-90). He was vice-director of the Cabinet of Natural History, and director of the Theatre de los Sitios, when he died. Far from resembling the detestable portrait which Beaumarchais draws of him, Clavijo was of a mild disposition, pleasing manners, and a clear understanding. Goethe founded his tragedy 'Clavijo' on Beaumarchais' story.

Clavis, klä'vis (Lat. "key"), a drawing, index, etc., which serves as a guide to the understanding of another work; for instance, *clavis Ciceronia*, *clavis Homerica*, etc.

Claws, sharp hardenings of the skin at the end of the limbs of animals. The term is often applied to the chelæ and similar structures at the end of arthropod limbs, but is best restricted to the horny nails found at the end of the digits in most reptiles, on the toes, and often on the thumb and first finger of birds, and seen in perfection in many mammals, such as the carnivores, insectivores, rodents, edentates, and others, where the nails are sharp and serve for scratching and clinging. See HOOF; HORN; NAIL.

Claxton, Alexander, American commodore: b. Maryland about 1790; d. Talcahuana, Chile, 7 March 1841. He entered the navy as midshipman in 1806, was promoted to a lieutenancy in 1813, and served in the sloop of war Wasp in her action with the British sloop of war Frolic, on 18 Oct. 1812. He was promoted to the rank of master commandant in March 1820, and to that of captain in 1831, performing much active service in both grades. He died while in command of the squadron in the Pacific Ocean.

Claxton, Kate (Stevenson), American actress: b. New York 1850. She was the daughter of Spencer Wallace Cone, and was married to Charles Stevenson in 1878. She made her début at Daly's Theatre before she was out of her teens, but her success dates from 1873, when she acted Mathilda in 'Led Astray.' As Louise in 'The Two Orphans' she attained great celebrity. She was playing the part at the Brooklyn Theatre when, on the night of 5 Dec. 1876, that structure was destroyed by fire with great loss of life. Since 1896 she has been touring the country in emotional plays.

Clay, Cassius Marcellus, American diplomatist: b. Madison County, Ky., 19 Oct. 1810; d. 21 July 1903. He graduated at Yale 1832, and three years later was elected to the legislature of Kentucky. The improved jury system and the common school system of Kentucky are in large measure due to his efforts while in the legislature. He denounced the scheme of Texan annexation as designed for the extension of slavery, and in 1844 traversed the northern States, addressing immense audiences in favor of the Whig presidential candidate. On 3 June 1845 he issued in Lexington, Ky., the first number of the 'True American' a weekly newspaper, devoted to the overthrow of slavery in that State. It aroused indignant opposition, and in August following his press was seized by a mob and sent to Cincinnati. He was threatened by public resolution with assassination, but revived his paper, printing it in Cincinnati and publishing it in Lexington. Public sentiment came gradually to support the principle of the freedom of the press, and Clay was able to keep an anti-slavery journal in the field, first at Lexington, and afterward at Louisville. He served in the Mexican war, was an opponent of slavery, and supported Lincoln for the presidency. From 1862 to 1869 he was minister to Russia. In 1886 he published his speeches, edited by Horace Greeley. In 1896 he supported the "gold" Democratic ticket.

Clay, Clermont Claiborne, American senator: b. Huntsville, Ala., 1819; d. there 3 Jan. 1882. He graduated at the University of Alabama in 1835, and after studying law in the University of Virginia, was admitted to the bar in 1840. He was elected to the Alabama legis-

CLAY

lature, 1842, 1844, and 1845; was judge of the Madison County court 1846-8. He was chosen United States Senator in 1853, and re-elected in 1859, receiving every vote in the legislature. In the Senate he supported the admission of Kansas under the Lecompton resolution, and was an ardent advocate of the State sovereignty doctrine. He was formally expelled in 1861, and became a senator in the Confederate Congress. In 1864 he was a secret agent of the Confederacy in Canada, but in May 1865 gave himself up to the United States authorities and was a fellow prisoner of Jefferson Davis at Fort Monroe. After his release in April 1866 he returned to the practice of law in Huntsville.

Clay, Frederic, English composer: b. Paris 3 Aug. 1840; d. London 27 Nov. 1889. He studied music at Paris, and settled in London as a composer for the stage, his most successful production being 'The Black Crook.' He composed several popular songs, the best known being 'She Wandered Down the Mountain Side.'

Clay, Green, American soldier: b. Powhatan County, Va., 1757; d. Kentucky 31 Oct. 1826. He was a cousin of Henry Clay (q.v.). He went to Kentucky early in life and there acquired a fortune as a surveyor. He filled many local offices, was a member of the convention that ratified the Federal constitution, of the Kentucky Constitutional Convention of 1799, and served for many years in the State legislature. On 16 March 1813, Gov. Shelby commissioned him a brigadier-general, and in May of that year, when Gen. Harrison was besieged by the British at Fort Meigs, on the Maumee River, Clay came to his relief with 3,000 volunteers. He was left in command of the fort and successfully defended it against a combined attack of British and Indians under Gen. Proctor and Tecumseh.

Clay, Henry, American statesman: b. Hanover County, Va., 12 April 1777; d. Washington, D. C., 29 June 1852. He was the son of a Baptist preacher who died in 1782, leaving but a small property to his widow and children. His early education was of a very limited character, and at 15 he was placed in a small retail store in Richmond. In a short time, however, he secured employment as a lawyer's clerk and after becoming a student of law was licensed to practice at the Virginia bar before he was 21 years of age. In less than a year later he removed to Lexington, Ky., and there began the practice of his profession, securing a lucrative business almost immediately. His success at this period is sometimes explained by reference to his frank, cordial, attractive manners, but no doubt his signal abilities had quite as much to do with it. In boyhood he had acquired the art of ready speech by solitary practice in the forest, barn, or cornfield, and the easy self-confidence which this had produced now stood him in good stead. In 1800 he was sent as representative to the Kentucky legislature and in 1806 was for a year United States senator to fill the unexpired term of Gen. Adair, who had resigned. He returned to the State legislature in 1807 and the next year, as the outcome of a dispute between himself and another member, Humphrey Marshall, challenged his opponent to a duel in which both were slightly wounded. In 1809 he was a second time chosen to fill a vacancy in the

national Senate, remaining there two years, making his first speech at this time in favor of protection. In 1811 he was elected to the House of Representatives and on his appearance there was chosen speaker by a large majority, a post which he retained till 1814. During this period Clay took an active part in the congressional debates respecting the second war with England, vigorously sustaining the war measures of the administration by his eloquence. In January 1814 Clay resigned his speakership, having been appointed one of the commissioners to negotiate a peace with England at Ghent, in Belgium. In this matter he was instrumental in securing to the United States the free navigation of the Mississippi. After the signing of the treaty he spent some time in Paris, and also in London, where he was cordially received, returning to America in September 1815. He was again elected to Congress and again chosen speaker, and at this time was a strenuous advocate of the independence of the Spanish-American republics, as well as of the stimulation of American industries by a protective tariff. Slavery was now becoming one of the most important of political questions as regarded its limitation or extension, and the admission of Missouri into the Union brought controversy to a white heat, the contention being whether or not it should be admitted as slave or free territory. Clay, if not the author of the celebrated "Missouri Compromise," establishing the line of 36° 30' as the northern limit of slave-holding territory, was its most earnest supporter. In 1824 he was a candidate for the presidency, in opposition to John Quincy Adams, Andrew Jackson, and William Crawford, and the Electoral College failing to make a choice, the election devolved upon the House of Representatives. On this occasion the election was secured for Adams through Clay and his friends voting in his favor. He was subsequently charged with bargaining by his enemies, in respect to his attitude at this time, but there is no evidence sustaining such a claim. John Randolph was the most persistent of Clay's defamers and after he had termed Clay's course in securing Adams' election as a "coalition of Puritan with blackleg" he was challenged to a duel by the other. During Adams' administration Clay was secretary of state, filling that office to general satisfaction, and in 1831 entered the Senate, where he led in the opposition to President Jackson's administrative policy, and attempted to prevent the removal of the deposits from the United States Bank. Largely through his influence the "Compromise Bill" was carried through Congress, which closed debate on the nullification question, through its partial reversal of the protective tariff. In 1832 Clay was for the second time a presidential candidate, but the popularity of Gen. Jackson was so great at this time that any other candidate had small chances of success, Clay receiving the votes only of Massachusetts, Rhode Island, Connecticut, Delaware, Maryland, and Kentucky. In March 1842 he resigned from the Senate and retired to private life, permanently, as he hoped. He was, however, in 1844, nominated a third time for the presidency and defeated after an intensely exciting political contest. The numerical majority was very small and his defeat was attributable in some degree to the influence of the administration. The primary cause, nevertheless, was the annex-

CLAY CENTER — CLAY

ation of Texas, a measure to which Clay had been opposed. After spending several years in retirement on his estate of Ashland, near Lexington, Ky., he was returned to the Senate in 1849, where he took an active part in the dispute between the slave-holding power and its opponents on the question of the admission of California, and devised the "Compromise of 1850," which terminated the long and bitter struggle. It has been sometimes urged against him as a reproach that he was always ready with a compromise in political emergencies, but in these matters he may have been wiser than his critics. For the greater part of his life he wielded a great political influence, acquired partly by his eloquence as an orator, partly by the fact that he never left his position in doubt on questions of national moment. By throwing the entire weight of his talents and influence in favor of a *via media* he more than once ended the violence of party strife which had reached so high a pitch as to endanger the national peace and the continuance of the government. In the crucial matter of slavery his counsels were moderate and his policy always pacificatory. In his latest years, however, this question had become too overwhelmingly important to be handled in any but the most resolute fashion and although the "Compromise of 1850" served its immediate turn, the day for compromises was nearly over, and this the great Kentuckian may have realized. This was his latest political effort and his death resulted, in effect, from the exhaustion induced by the controversy at this time. His political career extended over half a century and for much of that period he ranked as one of the foremost orators of the time. He was the subject of much adulation as well as of bitter slander. The latter was certainly undeserved, and if he does not bulk so largely in the minds of men at present as his admirers fondly anticipated, a juster estimate than any of which they were capable may find in him a truer greatness than they recognized. There were serious limitations in his character: He reflected the violence of his time, the tendency to unrestrained invective, once common among public men, but he also reflected much of its nobility, and his devotion to the real interests of his country can scarcely be doubted. Consult Cotton, 'Life and Times of Henry Clay'; Schurz, 'Henry Clay' (1887); Parton, 'Famous Americans.'

OSCAR FAY ADAMS.

Clay Center, Kan., the county-seat of Clay County, is situated on the Union P., and Chicago, R. I. & P. R.R.'s, and on the Republican River, which supplies ample water-power. The principal industries are the manufacture of foundry and machine-shop products and flour, and the cultivation of nursery stock. The city is somewhat noted for its greenhouses. Pop. (1900) 3,069.

Clay, any aluminous silicate having plasticity: that is, which can be molded, when moist, into forms which become stone hard after exposure to a red heat or higher temperature. Plasticity is a physical quality, apparently having little relation to chemical composition, and the exact reason why one clay is more plastic than another is even yet largely a matter of speculation. In a broad way clays may be divided into: (1) Pure clays, mostly

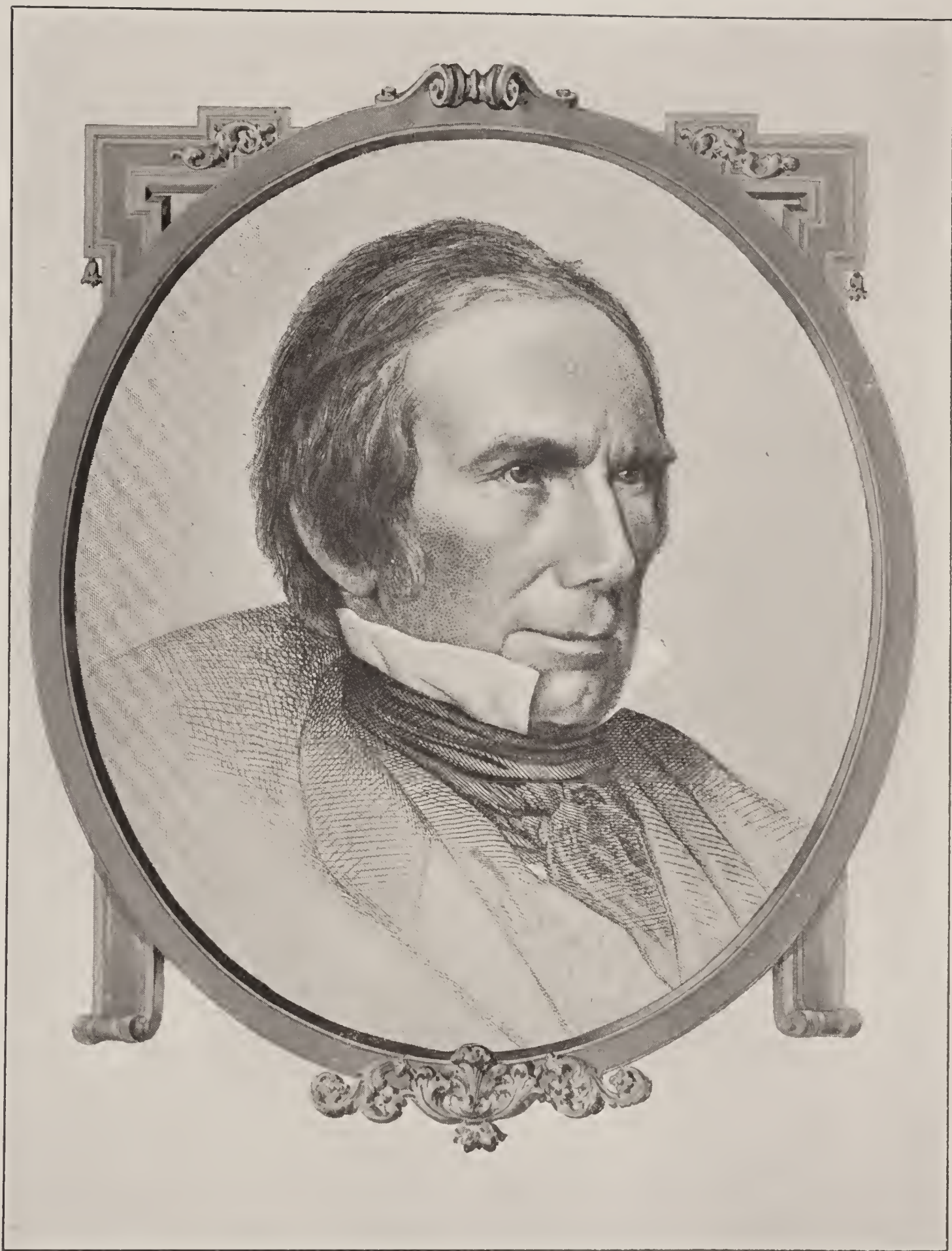
silica and alumina, with small amounts of iron, lime, magnesia, soda, and potash; (2) sandy clays or loams, comprising much of the arable soil of the world; and (3) limy clays or marls, clays containing a high per cent of lime. Clays are also given a great variety of names, according to special characteristics and economic use. The important divisions, based on use in the arts are: Kaolin, or China clay, pottery clay, fire clay, and brick clay.

Origin of Clay.—The base of all clays is the mineral kaolinite, having the formula $Al_2O_3 \cdot 2SiO_2 + 2H_2O$, giving silica 46.3 per cent; alumina, 39.8 per cent; water, 13.9 per cent. It is made up of minute hexagonal plates. It results from the decay of feldspathic rocks, particularly granites and gneisses. Surface waters percolating through such rocks leach out the potash in the feldspar; some silica is also leached out and left in a hydrated state. Kaolinite results from the union of the broken-down alumina of the feldspar with the hydrated silica. Thus were formed in place the kaolin deposits of Cornwall, England, and some of the kaolin of North Carolina and Pennsylvania. By the erosion of the land the kaolin and other products of rock decay are carried away and deposited as silts in lakes or in the ocean. Also, under the grinding of glaciers, rocks are reduced to a fine rock flour, forming glacial clays (boulder clay or till). The beds of clay laid down in the ocean may be buried deeply under other deposits, and by heat and pressure be changed to shale. When the sea bottom is elevated and the new land surface eroded, the shale may disintegrate into clay again, or the shale itself may be mined by man, ground, and used as clay.

Varieties of Clay.—Pure kaolin or China clay is rare. It is pure white and almost free from iron salts. The common chemical impurities in the crude material are silica, iron, lime, alkalis, magnesia, and titanium, and the common mineral impurities are quartz, feldspar, mica, calcite, magnetite, limonite, and pyrite. If the product is white, contains very little iron, and is low in alkalis it passes in the trade as kaolin. Kaolin has little plasticity, and in making pottery other clays are often added to give this quality. It may occur as residual kaolin in the position of the original feldspar body, a vein or dike, or, if transported by streams and deposited at a distance in beds, as sedimentary kaolin. Residual kaolin is apt to be of better quality than sedimentary, containing less iron and other impurities.

The United States imported about 130,000 tons of kaolin in 1902, the production for 1901 having been 97,253 short tons. Kaolin is mined in De Kalb and Jefferson counties, Ala.; at Hockessin, Del.; in Taylor County, Ga.; at Blandford, Mass.; in Macon, Jackson, and Montgomery counties, N. C.; in Chester and Delaware counties, and in the South Mountain region, Pa.; in Aiken County, S. C.; and in Lake County, Fla.; and there are deposits in Missouri, Tennessee, and several other States.

Besides being used in making pottery and white tiling and brick, kaolin is largely employed in the manufacture of paper, for weighting the paper and giving a better surface. The largest pottery manufactures in the United States are at Trenton, N. J., and East Liverpool, Ohio. Nearly all the Chester County, Pa., kaolin goes



HENRY CLAY.

CLAY

to those places. The South Carolina kaolin is nearly all used in paper-making.

ANALYSIS OF VARIOUS CLAYS.

	Si O ₂	Al ₂ O ₃	H ₂ O	Fe ₂ O ₃	Ca O	MgO	Na ₂ O K ₂ O	Ti O ₂
1	53.10	33.06	11.32	1.18	0.38	0.08	0.83	—
2	73.80	17.30	4.69	.35	—	1.18	2.49	—
3	59.83	24.58	7.83	1.66	0.28	0.87	3.11	1.17
4	68.13	20.80	6.72	1.20	0.42	0.37	2.55	—
5	67.80	11.55	0.20	6.50	8.90	5.32	2.42	—
6	56.10	27.42	8.90	2.68	—	0.18	2.71	1.0
7	40.22	8.47	20.71	2.83	15.45	7.80	3.20	—
8	57.46	21.15	—	5.52	3.65	1.50	4.72	—

1. Crude kaolin, West's Hill, N. C. 2. Refined kaolin, Mt. Holly, Pa. 3. Fire clay, Bolivar, Pa. 4. Pottery clay, Zanesville, O. 5. Paving brick clay, Bloomington, Ill. 6. Front brick clay, Sayreville, N. J. 7. Brick clay, Milwaukee, Wis. 8. Terra-cotta clay, Glens Falls, N. Y.

Fire Clays differ much in color, hardness, texture, and composition, and some clays used in making fire brick are not particularly refractory, but are used for their high plasticity. Strictly a fire clay is a nearly pure mixture of sand and clay with only traces of iron, lime, and magnesia, and hence makes white or light colored bricks which can stand very high temperatures. According to Ries a clay should not be considered refractory unless its fusing point is above 2,700° F. Fire clays are divided into plastic and flint, the former, if hard when dug, becoming plastic when ground and mixed with water; the latter, though sometimes having nearly the same composition, do not become plastic when similarly treated. Fire clays, like kaolins, are sometimes residual products of the decay of feldspar veins, but most are of sedimentary origin. Some form the underclay of coal seams, but all such underclays are not refractory. The underclays of the Michigan coal beds are not. Fire clays in the United States are found in rocks of many geological periods, but chiefly in the Carboniferous and Cretaceous. Workable deposits are known in 18 States; important deposits being in western Pennsylvania; in the coal-mining region of Ohio; in a belt across New Jersey from Perth Amboy to Trenton; in Cecil, Garrett, and Allegany counties, Md.; near St. Louis, Mo.; near Woodstock and Aniston, Ala.; and near Golden, Colo.

Potters' Clay.—Clays for potters' use, apart from the materials used in accessory work, such as fire-brick, saggers, etc., are divided into two classes, kaolins and ball clays. The former term is derived from the Chinese Kao-ling, meaning lofty hill. The Chinese porcelain clay was found in quantities in a hill thus named, and the term applied to the clay served to define it. The word kaolin is now applied by common consent to a residual clay which remains white after burning. A residual clay is one which lies as it was formed. Masses of feldspar have been decomposed, the contained potash has been gradually dissolved by carbonated waters, and the residue of silica and alumina has been left. There is usually more or less undecomposed feldspar and grains of quartz associated with the clay, and hence most kaolins are washed before being put on the market.

Kaolin is well known as forming one of the

ingredients in Oriental porcelain, the other ingredient being a quartzose feldspathic rock called in China *petuntze*. For Sèvres porcelain kaolin is obtained from Limoges.

Ball clay,—probably corrupted from bowl clay,—is a sedimentary clay, having been washed up and redeposited. It is valued for a high plasticity which kaolin does not possess. The purest ball clay is found in Florida and is sold under the name of "plastic kaolin." Most of these clays burn to a cream or almost a stone color. They are mined in New Jersey, Kentucky, Missouri, and Colorado, in addition to the Florida clay already mentioned. Ball clays are not usually washed before use.

Pure clay is a hydrated silicate of alumina containing about 46 per cent silica, 39 per cent alumina, and 14 per cent water. There is no clay known, however, which contains more than 98 per cent of this silicate, even after washing.

Brick Clays are mixtures of sand and pure clay with lime, magnesia, iron, potash, and soda; in fact, bricks are often made from sandy mixtures which are not properly clay. A mixture with considerable iron burns red, from the oxidation of the iron. Carbonate of lime, or magnesia, by forming light-colored silicates, counteracts this red color. Thus the red clays of Wisconsin, which sometimes contain 20 per cent of lime, make the cream-colored Milwaukee brick. The sedimentary glacial clays are largely used for brick-making in the northern States, sedimentary surface clays and loams in the western States, and residual clays in the southern States. All that is required is that the brick shall be of good color, dense, hard, and of regular form. Brick material of good quality is found in nearly every State of the Union.

For making paving-brick a clay or shale should be relatively high in lime, iron, and the alkalis, that it may vitrify well in burning. When ground and mixed the clay or shale should be fine-grained and plastic, and should shrink but little when burned. Of the western States Illinois leads in the production of paving-brick, with Missouri second.

The very plastic clay known as gumbo in the southern States, besides other clays, are burnt in small lumps and used as ballast by a number of railroads.

Terra cotta, used in fire-proof construction and for decoration, may be made of any clay that will make good, strong brick, and contains no excess of soluble salts that will "whitewash" on weathering.

Methods of Mining.—The clay, if it lies at or near the surface, is first stripped of soil or sand and gravel; sometimes as much as 30 feet being removed. In New Jersey the clay is often dug in pits as deep as the thickness of the bed by hand labor. Usually clay beds are worked either by digging the clay entirely from the base of the bank, by working the bank on an incline of about 30° or, where the bank is over 30 feet high, by working in benches six to eight feet wide and seven to nine feet high. Steam shovels are sometimes used. Where the clay is tough it is often worked by undermining several feet and then breaking a foot or more from the face by wedges. Blasting is used in very tough clay and in shale. If the clay lies at some depth, drifts large enough for a man and a wheelbarrow are driven in to the bank side by side.

CLAY IRON-STONE — CLAY-WORKING MACHINERY

Sometimes a shaft is sunk and drifts driven from the base, this method being used in Pennsylvania and Ohio and in the fire-clay beds of Missouri.

Egyptianized Clay.—A discovery which gives good promise of affecting the clay industry and its various branches has been made by Mr. E. G. Acheson of Niagara Falls. While experimenting in crucible manufacture, Mr. Acheson had occasion to search for a clay possessing certain qualities. After a series of experiments the account of Egyptian brick-making given in the fifth chapter of Exodus attracted his attention, and conceiving the idea that some property in the straw used in brick-making in Egypt might give him the result he sought, he boiled a quantity of straw, obtaining a dark-red liquid which he used in the treatment of clay, finding it excellent for increasing its plasticity. He sought out the principle, and determined that the agent was tannin. He treated other clays with water in which tannin was in solution, and realized that he had made an important discovery.

The name given by Mr. Acheson to clay treated by his process is "Egyptianized clay." He has discovered that it is practicable so to treat clay and other earthy materials as to ensure greater strength in the products made therefrom, also to greatly reduce the shrinkage and warping in the process of drying and baking, and to increase the solubility and the plasticity of the material. By his process, non-plastic clays may be rendered plastic, and plastic clays made more plastic by treatment with tannin or an agent having the astringent principles of tannin.

It has been found by experts of the highest standing that clay so treated is changed in a remarkable manner. Even one half of 1 per cent of tannin develops a wonderful effect, requiring 13 per cent less water to make the clay soft. The maximum effect of the process and treatment, however, seems to be obtained by the use of 2 per cent of tannin in a 10-day treatment, consisting in keeping the clay wet, so that the tannin is dissolved. In the burned form the strength of the clay is increased 50 per cent, while in the sun-dried form it is increased in tensile strength 350 per cent. It is also observed that the Acheson treatment removes the crackling tendencies of many clays. In cases where clay articles are to be made of a certain size, they can be made more exact by the Acheson process, as there is less shrinkage. All parts intended to carry loads may be greatly increased in strength, while there is decreased porosity. Many of the plastic clays are off color, but non-plastic clays of desired color will be brought into service by the Acheson process. In making glass pots it now takes months to "age" or temper the clay, while with the Acheson process the maximum effect is obtained in a 10-day treatment. It is told of the Chinese that the people of one generation prepare the clay for the use of the next, all of which time is spent in making the clay plastic. Under the Acheson process the results are said to be more pronounced in 10 days than obtained by old methods in years.

The following States in 1901 manufactured clay products to the value of \$3,000,000 or over. The figures are from 'The Mineral Industry':

STATE	Brick and Tile	Pottery	Total
Ohio.....	\$11,526,424	\$10,048,561	\$21,574,985
Pennsylvania.....	13,656,730	1,665,012	15,321,742
New Jersey.....	5,781,805	5,900,073	11,681,878
Illinois.....	8,960,041	682,449	9,642,490
New York.....	7,214,358	1,077,360	8,291,718
Missouri.....	4,409,906	64,647	4,474,553
Indiana.....	3,935,083	531,371	4,466,454

The total value of the clay products made in the United States in 1901 was \$87,747,727, classified as follows:

Common brick.....	\$45,503,076
Front brick.....	4,709,737
Fire brick.....	9,870,421
Paving and vitrified brick.....	5,484,134
Sewer and drain tile.....	6,736,969
Crude clay and various manufactures.....	15,443,390

Bibliography.—For statistics of production, see 'The Mineral Industry.' For general works, see Davis, 'Practical Treatise on Manufacture of Bricks, Tile, and Terra Cotta'; Fairie, 'Notes on Pottery Clays: Their Distribution, Properties, and Uses, with Analyses of Ball Clays, China Clays, and China Stone'; Sandeman, 'Notes on the Manufacture of Earthenware'; also the following bulletins and reports: 'New York State Museum Bulletin 35'; 'New Jersey Geological Survey Report 1878'; 'Ohio Geological Survey Report 1893' (Vol. VII., Part I.); 'Missouri Geological Survey' (Vol. II.); 'Wisconsin Geological Survey Bulletin 8' (Part I.); 'Twentieth Annual Report of the Geological Survey of Indiana'; 'Report of Pennsylvania State College 1897'; 'North Carolina Geological Survey Bulletin 13.' See CLAY-WORKING MACHINERY.

Clay Iron-Stone, oxide of iron (hematite) mixed with clay or sand, an iron ore of importance in England. It is hard and red to brownish-black in color. The name is also given to the argillaceous carbonate of iron occurring in nodules and beds in the coal regions of Pennsylvania, Ohio, and other States. When intimately mixed with coal, as in Scotland ("black-band iron-stone"), it is of importance as an iron ore (q.v.).

Clay-working Machinery. They constitute a great variety of machines designed for the proper preparation of clay which is subsequently used in the manufacture of bricks, tiles, pipes, etc., in the production of which the importance of this proper preparation of the clay can scarcely be overestimated. A great many of the subsequent difficulties, imperfections, and the amount of waste product in the manufacture of articles from clay may be traced directly to negligence in the proper treatment of the clay prior to its use in the molding machines. Among the principal machines of this class are the

Fig. 1, bevel-gear clay granulator and feeder, designed to work on a horizontal plane, and reduce lumpy clay into a mass of uniform texture before it is fed into the molding machines. It consists of a tub the sides of which may be made either flared or vertical, within which is rotated a main shaft nine inches in diameter, carrying 40 forged-steel knives. The driving and counter pinions are of steel, and all gears are journaled in an iron frame bolted to 12 x 12-inch hardwood timbers. The friction-clutch pulley is 40 inches in diameter, with

CLAY-WORKING MACHINERY

12-inch face, and the length of frame 19 feet, with a width of 5 feet 6 inches. Height from bottom frame to top of flared hopper, 3 feet. It weighs about 14,000 pounds, and granulates clay that may be dumped into it by the car-

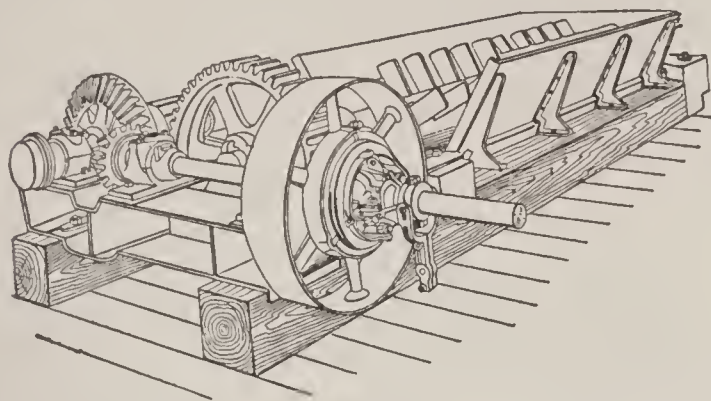


FIG. 1.—Bevel-gear Clay Granulator and Feeder.

load, and in lumps as dug out by a steam-shovel. The object of the double shaft construction may be illustrated in the case of bricks made from a mixture of two kinds of clay—one very strong and the other very weak. The strong clay is dumped by the cartload into one tub, and the weak clay into the other, without regard to proportion. The knives and bars of the pug-shaft are each given a relative set representing the proportions desired, and as both shafts make the same number of revolutions per minute, the mill discharges into a common receptacle a granulated mass of material made up of each kind of clay in exact proportions. The knives being made of carefully tempered steel of great strength, will shave the large lumps of clay, clean it from stones, and feed uniformly any desired quantity. These machines are frequently used to feed into disintegrators, or some form of crushing rolls used for fine grinding, affording the advantage of having such crushers fed uniformly instead of being alternately overloaded or empty.

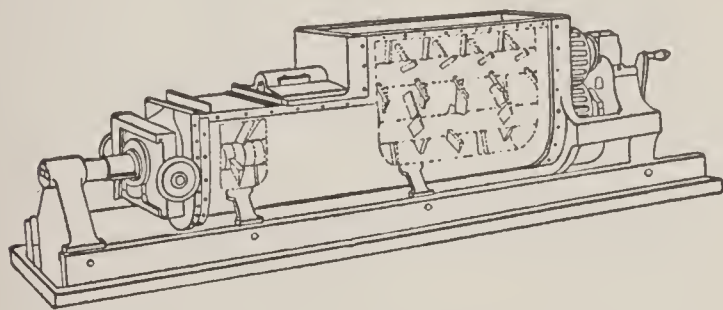


FIG. 2.—Mixing and Pugging Machine.

Fig. 2 is an example of the mixing and pugging machines, designed to mix two or more ingredients, or dry and wet materials, and to deliver a thoroughly mixed, well-pugged mass, in uniform quantity. It is especially valuable as a mixer of "grog" or ground calcined material with plastic clay, ground shale with tough clays, and other finely ground or granular material with plastic binders. This machine combines the features of the double shaft mill for mixing different materials, with the long inclosed case containing a single shaft only, for pugging stiff plastic clays. The main pug-shaft is of hammered steel, seven inches in diameter, and is fitted with steel-faced tempering knives, which may be adjusted to any desired position. Situated immediately over the shaft and extending to about one half the length of the pug chamber, is an independent mixing

shaft equipped with four rows of steel bars so placed that they just clear the tempering knives of the main shaft, the distance between the two shafts only slightly exceeding the length of the tempering knives. The action of these shafts, together with the close passage of the knives and bars, produces a thorough mixture of the different components of the material worked before it reaches that part of the chamber in which the pugging process is completed. The rear portion of the pug chamber being open at the top, gives an ample opportunity for the examination of the material, and the regulation of the water supply while the mixed and moistened mass of material is slowly and continuously fed into the enclosed portion of the pug chamber, where it is thoroughly pugged under pressure and discharged by means of a short, double-bitted, hard auger through a circular orifice, the size of which may be changed at will. The entire machine is about 19 feet in length, is strongly built, and mounted on channel-iron framing, with driving-gear journaled in one solid casting. The driving-belt is fitted with an outer bearing and with a friction-clutch pulley 48 inches diameter by 12-inch face.

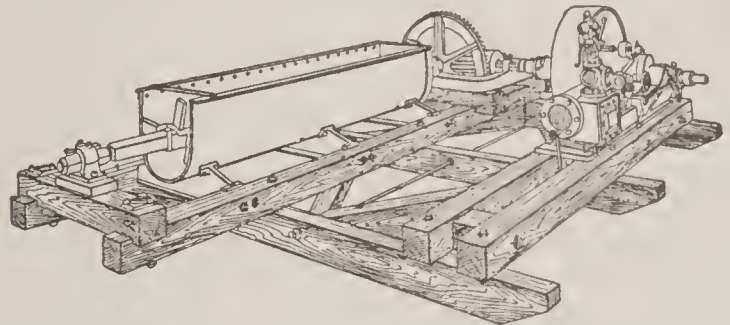


FIG. 3.—All-iron single-shaft pug-mill with direct connected engine.

Fig. 3 shows an all-iron single-shaft pug-mill of the open-top horizontal type. It may be used, however, with the front end elevated, and is designed for making concrete and cement mixtures, or for making stiff clay puddle for reservoir beds. It may be equipped with spur-gears, is about 10 feet long, of very simple construction, and operates a single shaft carrying 40 forged-steel knives so secured that they may be set at any desired angle with the shaft. Puddle-making machines used in the preparation of concrete are of a similar character. They are especially adapted for mixing clay and stones and working them into a stiff puddle suitable for lining reservoir beds and other similar work. They may be arranged to be driven by belting, or for direct connection with an engine or electric motor.

Another important class of clay-working machines are the grinders, stone extractors, and the crushers.

Fig. 4 shows an all-iron and steel dry-pan, which is probably the most useful machine for grinding shale, such as are generally used in the manufacture of street-paving bricks, and in fact all of the ordinary brick clays when dried sufficiently to pass through a screen. The machine consists essentially of a pair of heavy iron rollers which rotate vertically and grind against iron sectional plates rotating horizontally. In the machine illustrated, the grinding rollers are 48 inches in diameter by 12-inch face, their combined weight, together with that of their shafts and boxes, being about 13,000

CLAY-WORKING MACHINERY

pounds. The sectional grinding plates are 3 inches thick, and are made with babbitted pockets attached to their under sides to insure their setting perfectly true and level. The plows or scrapers run close to the screens, and are so constructed that the portions subject to wear

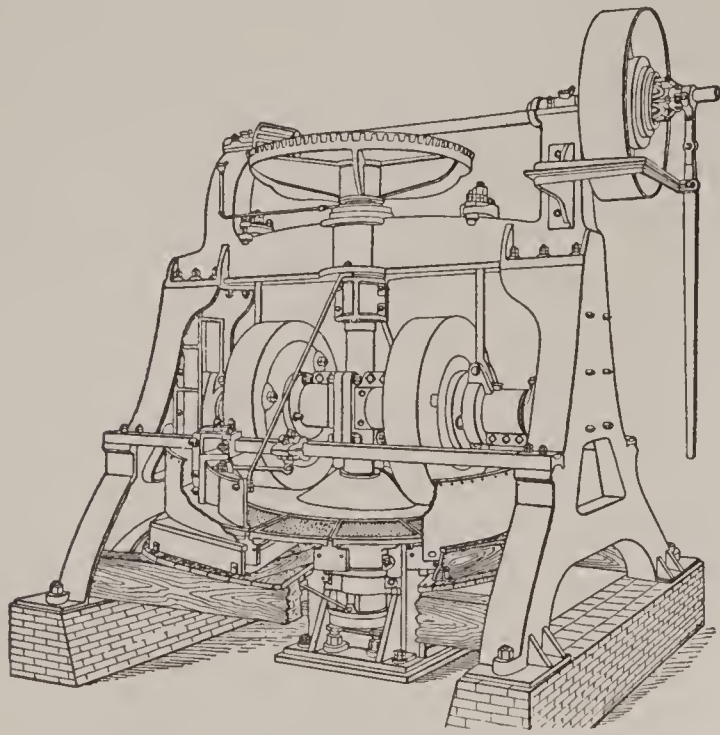


FIG. 4.—Dry-Pan.

are easily and cheaply renewable. The inner side of the heavy iron curb has an angle-iron rim riveted to its upper edge to strengthen it, and to prevent the overflow of fine material. The capacity of this machine depends entirely upon the nature of the material ground, the amount of moisture contained in that material, and the size and pattern of the screen openings. The total weight of the machine is about 40,000 pounds, and it is fitted with a friction-clutch pulley 48 x 12 inches, on a 3-inch driving shaft.

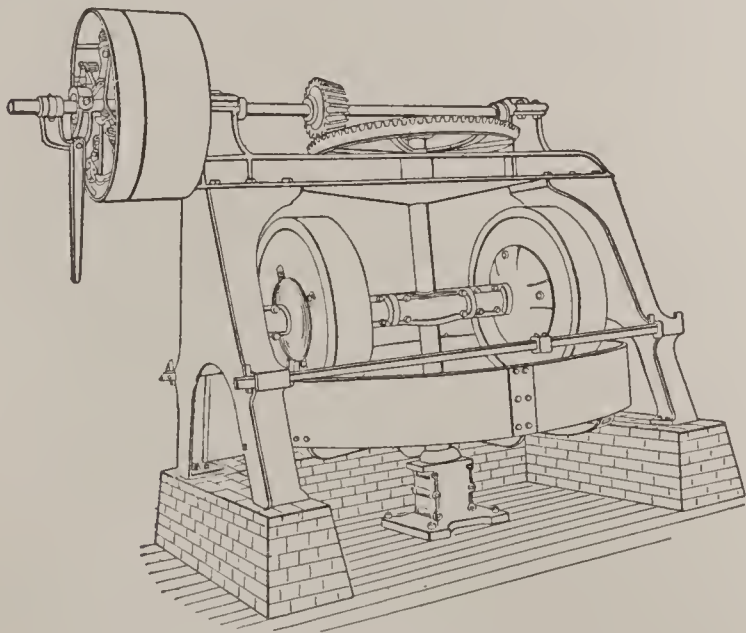


FIG. 5.—Wet-Pan.

Fig. 5 shows a type of wet-pan especially valuable for grinding stony or pebbly clays so as to reduce the stones and amalgamate them with the clay. It is a thorough pugger and mixer for all kinds of clay. The mullers or grinding rollers have hard-chilled faces, are 46 inches in diameter, with 8-inch faces, and their centres are bulged heavily to give additional weight.

Fig. 6 shows a form of the clay disintegrators employed to work plastic clays in which flint

stone and gravel are imbedded. It consists of two rollers, one of which is driven at a high rate of speed—700 revolutions per minute—while the other is run at a rate varying from 50 to 100 revolutions per minute and acts merely as a feed roll. The fast-running roll is equipped with one or more continuous steel bars which project slightly beyond its face and act with a chipping action against lumps of strong, tough

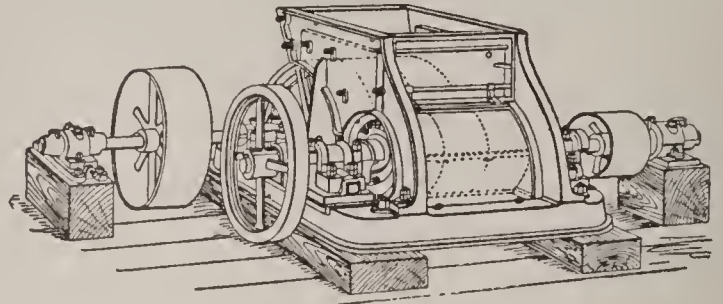


FIG. 6.—Clay Disintegrator.

clays, and also throw out the larger stones against which they come in contact, while the pebbles are crushed and ground up with the clay. It has a broad, heavy iron bedplate. The parting strain between the two cylinders is borne by two heavy through-bolts which pass from one journal box to the other, and also enables the regulating of the distance between the centres so as to prepare clay of any desired degree of fineness.

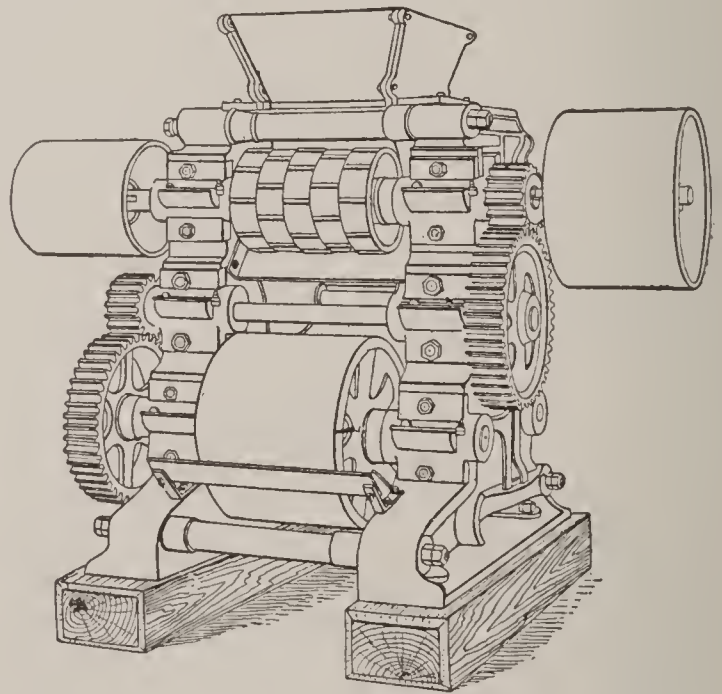


FIG. 7.—Four-roll Combination Crusher.

Fig. 7 shows a four-roll combination crusher. Compound clay-crushing rolls are made in a great variety of patterns. The machine illustrated combines the features of a disintegrator and a smooth-roll crusher, and is especially useful for the working of clays that require an extra amount of preparation, or those having a limited amount of small stones, or of a lumpy nature. The upper section is made of two rolls running at variable speed. Similar to that of the disintegrator, the small or high-speed roll has projecting lugs of hardened steel, or it may be studded with steel bolts set staggered so as to form corrugations. The large roll operates at a slower speed. The effect of the combined motions of these rolls is to shred or separate the material and prepare it for the further action of the lower section, which is composed of two large chilled-face rolls also run at differ-

CLAY MARL — CLAYPOLE

ential speed. The lower rolls may be adjusted close to each other and thus act as fine grinders of the material partially prepared by the upper set.

Of the various machines and appliances employed in the working of clay, other than those already described, Fig. 8 shows a type of belt-

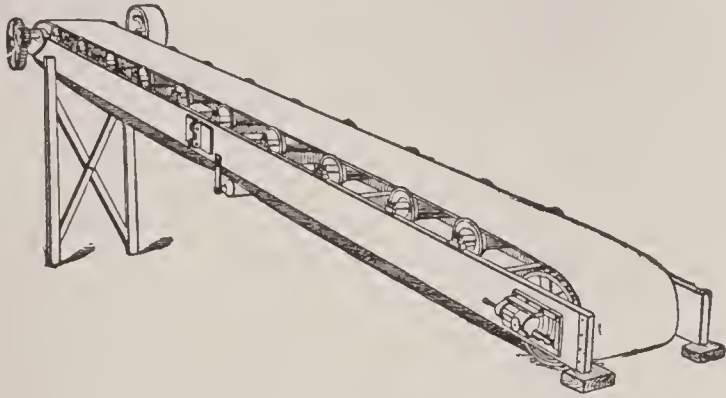


FIG. 8.—Belt-Conveyor.

conveyor; Fig. 9 a bucket elevator, and Fig. 10 a steam-shovel. When it is necessary to dig a quantity of clay sufficient for an output of 50,000 bricks per day, the steam-shovel can be used profitably; while for an output of 100,000

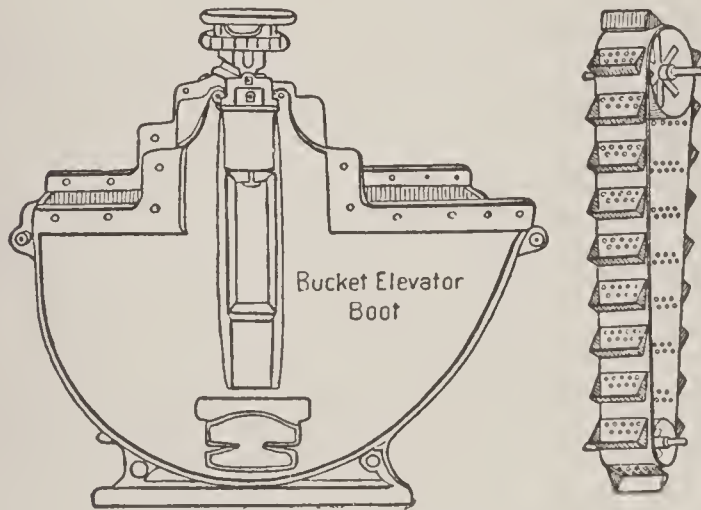


FIG. 9.—Bucket-Elevator.

or more bricks per day, the cost per 1,000, to dig and haul clay with the aid of the steam-shovel and suitable dump cars, is fully one half less than to dig by hand and haul with horses and carts. These machines can be practically

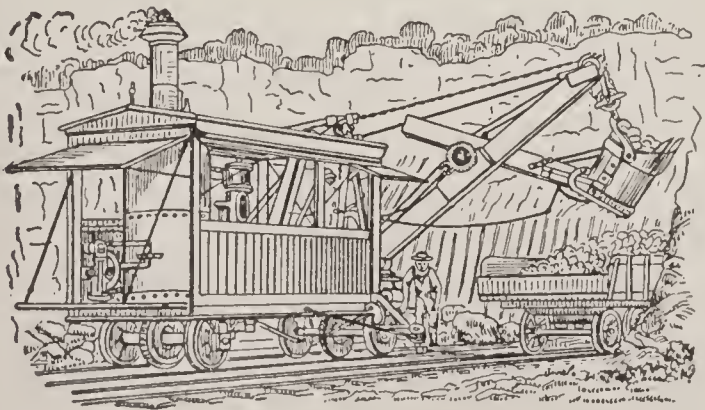


FIG. 10.—Steam Shovel.

and profitably used to work clay-banks ranging from 5 to 25 feet, depth of face, and will dig a width ranging from 35 to 38 feet. They have capacities ranging from 300 to 500 yards per day.

One of the latest inventions in clay-working machines is the hollow-ware machine shown in

Fig. 11. It is particularly adapted for the manufacture of all kinds of hollow-ware, fire-proofing, and a great variety of other shapes from plastic material. It is built with a telescoping or adjustable front by which the relative dis-

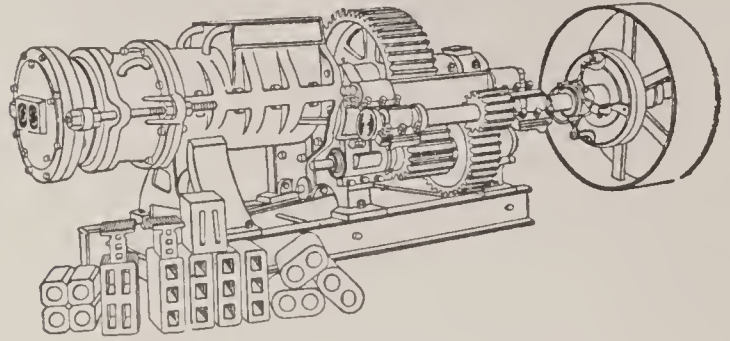


FIG. 11.—Hollow-ware Machine.

tance between the forming-die and the auger can be changed at will, thus adapting it to any pattern of die, or any kind of material. See BRICK; BRICK-MAKING MACHINERY; PIPES.

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Consulting Engineer, New York.

Clay Marl. See MARL; SOIL.

Clayberg, John Bertrand, American lawyer: b. in Cuba, Ill., 8 Oct. 1853. He received his early education in the schools of Cuba, and later entered the law department of the University of Michigan, from which he was graduated in 1875. He was admitted to the bar in 1875 and was employed by Judge Thomas M. Cooley in works on 'Taxations' and 'Torts.' He moved to Montana in 1884, and in 1889 was elected attorney-general of the State. Since 1891 he has been a non-resident lecturer on mining law in the University of Michigan, and has been a large contributor to the law journals of the Northwest. On 7 March 1903 he was appointed chief commissioner of the supreme court of Montana.

Clayden, Peter William, English Unitarian clergyman and author: b. Wallingford, Eng., 20 Oct. 1827; d. London 19 Feb. 1902. After being pastor of Unitarian congregations at Boston, Lincolnshire, 1855-9; Rochdale 1860; and Nottingham 1860-8, he became one of the staff of the London *Daily News*, on which he remained till 1896, in the meantime establishing the *Reading Observer* in 1873, remaining its proprietor for six years. He published: 'The Religious Value of the Doctrine of Continuity' (1866); 'Scientific Men and Religious Teachers' (1874); 'England Under Beaconsfield' (1880); 'Samuel Sharpe, Egyptologist' (1883); 'The Early Life of Samuel Rogers' (1887); 'Rogers and His Contemporaries' (1889); 'England Under the Coalition' (1892).

Clayite, a mineral from Peru, occurring crystallized and as a crust on quartz, a sulpharsenite of copper with sulph-antimonites of copper and lead. Has a hardness of 2.5.

Clay'more, formerly the large two-handed, double-edged sword of the Scotch Highlanders; now the name is given to a basket-hilted, double-edged broadsword.

Claypole, Edward Waller, American geologist: b. England 1 June 1835; d. Long Beach, Cal., 17 Aug. 1901. He was graduated at the University of London in 1862; was professor of geology and biology in the California Polytech-

CLAYPOLE — CLAYTON-BULWER TREATY

nic Institute in Pasadena, and for a time was on the geological survey of Pennsylvania. He was the author of numerous reports on the geology of Perry County, Pa., and of papers and essays on geological and biological subjects. He was a member of a number of geological societies in London, Edinburgh, and America, and of the American Association for the Advancement of Sciences.

Claypole, Noah, the sneaking, cowardly apprentice in Dickens' 'Oliver Twist,' who robs his master's till, joins Fagin in London, and by turning state's evidence insures the conviction of Bill Sykes for the murder of Nancy.

Clayton, Augustine Smith, American lawyer: b. Fredericksburg, Va., 27 Nov. 1783; d. Athens, Ga., 21 June 1839. He graduated at the University of Georgia 1804; was admitted to the bar, and practised with eminent success. He served in the State legislature; was judge of the superior court 1819-25 and 1828-31; and a representative in Congress from 1831 to 1835. In Congress he opposed the tariff and United States bank measures. He is said to be the author of the political pamphlet 'Crockett's Life of Van Buren.' He compiled 'The Laws of Georgia, 1800-10' (1812).

Clayton, Estelle Evesson, American actress and dramatist: b. New York State; married to Charles W. Durant in 1888. She began her stage career in 1878, playing Agnes Wickfield in 'Wilkins Micawber.' She has played Nora in 'Esmeralda,' and Constance in 'Young Mrs. Winthrop' with conspicuous success. In 1885 she wrote and produced at Madison Square Theatre, New York, 'Tric-o-Trin,' and in 1888 dramatized Amelie Rives' famous novel, 'The Quick or the Dead,' and played it with great success throughout the southern States. She wrote the text for the operas 'Paulita' (1890), and 'The Viking' (1895), and a comedy, 'A Puritan Romance' (1897), which was produced in London with success.

Clayton, John, American botanist: b. Fulham, England, 1686; d. Virginia 15 Dec. 1773. In 1705 his family came to Virginia, where his father became attorney-general, and took up their residence near Williamsburg. He entered the office of Peter Beverly, clerk of Gloucester County, succeeded him, and held the office for 51 years. He was an enthusiastic botanist, and throughout his long life delighted in exploring and describing the plants of his region. Gronovius and Linnæus published an account of specimens of Virginia flora sent them by Clayton (Leyden 1739-43), and Gronovius' son named a genus of herbaceous plants *Claytonia* in his honor. Clayton's studies of Virginia natural history were published in the 'Philosophical Transactions' of the London Royal Society, and his descriptions of some new species of plants are to be found in the third volume of Peter Force's 'Tracts.' Two folio volumes of manuscript, almost ready for the press, were burned with the records of New Kent County during the Revolutionary War.

Clayton, John Middleton, American statesman: b. Sussex County, Del., 24 July 1796; d. Dover, Del., 9 Nov. 1856. He was elected United States senator in 1829, and held office till the close of 1836, when he resigned. He was then appointed chief justice of his native State, and continued on the bench for nearly

three years. In 1845 he was again sent to the Senate, and remained there till March 1849, when he became secretary of state under Gen. Taylor. In this capacity he negotiated the Clayton-Bulwer Treaty (q.v.), adjusting the respective claims of Great Britain and this country in Central America. Clayton resigned office on Gen. Taylor's death in 1850, but remained in the Senate till his death. He was a zealous Whig, an able debater, and a statesman of high talent and upright character.

Clayton, Powell, American soldier and diplomatist: b. Bethel, Pa., 7 Aug. 1833. He received an academic education in Bristol, Pa.; later studied civil engineering, and went to Leavenworth, Kan., as engineer and surveyor in 1859. When the Civil War broke out he entered the Union army as captain of the 1st Kansas Infantry. In May 1863 he led a successful expedition against a band of guerrillas on the White River, Ark., and also to destroy Confederate stores; and in 1864 was promoted brigadier-general of volunteers. At the close of the war he settled in Arkansas; was elected governor in 1868; United States senator in 1871-7; appointed minister to Mexico in 1897, and raised to rank of ambassador in 1899.

Clayton-Bulwer Treaty, a treaty existing from 1850 to 1901 between the United States and Great Britain. It was an agreement designed to prevent either country from securing exclusive rights over any interoceanic canal across Nicaragua (See ISTHMIAN CANALS, AMERICAN). Its origin represented a supposed mutual withdrawal from positions rapidly generating war. Its lifetime has two opposite phases: (1) That in which the United States, wishing no such exclusive rights, held it and appealed to it as a bulwark against British encroachments, opposing only an injurious interpretation of it; (2) that in which the same power did wish such privileges, endeavored first to gain British assent to its abrogation, and after long and fruitless struggles and repeated threats of abrogating it without such assent, was only withheld from the abrogation by a compromise treaty which replaced the old. The three periods were as follows:

1. The English colony at Belize (now British Honduras), for a century or more had strengthened their position against the Spaniards by a vague protectorate over the Mosquito Indians, occupying the northeast coast of Nicaragua. They termed their chiefs "kings," and upheld their dominion over "Mosquitia," usually called the Mosquito Coast. In 1815 they crowned one of them at Belize and, when the Spaniards lost control of Central America in 1822, had him set up a claim to boundaries reaching down into Costa Rica, and so including the banks of the San Juan River, where the canal would run if built. In 1841 this sovereignty was enforced by raiding San Juan del Norte at the mouth of the river, and carrying off the commandant; in 1847 the "king" announced to Nicaragua that on the first of January next he should "reassume his lawful control" over the San Juan, and early in the year the English seized the town and renamed it Greytown. A new English treaty was then made with Nicaragua, recognizing this occupation. This roused great excitement in the United States, as equally a blow at the Monroe Doctrine and against American control of the

CLAYTON-BULWER TREATY

canal; and an over-zealous Nicaragua chargé of the fire-eating Polk administration drafted a treaty for United States fortification of the canal, and a guarantee of Nicaragua's sovereignty over all the territory she claimed. This, if we made its provisions active, meant war with England. The pacific Taylor administration then in power framed a milder treaty for a right of way merely, allowing Nicaragua to make similar ones with other nations. This still left Greytown as an apple of discord, and conflicted with the English treaty. Both England and America were on edge with suspicion: the former (whom events justified) that American expansion would end in a claim to entire control of the canal, which would prejudice British colonial interests; the United States, that the English recognition of a fictitious and swollen sovereignty by a tribe of savages over the Atlantic end of the canal foreshadowed the total exclusion of the United States. Each party in fact wanted only to bar the other's monopoly. John M. Clayton (q.v.), secretary of state, opened negotiations with the English minister, Sir Henry Bulwer (q.v.), in January 1850, for a joint control. Meantime Great Britain, to secure the Pacific end, sent an expedition to occupy an island in the Gulf of Fonseca (then supposed to be the natural western terminal); our then Nicaraguan representative, E. G. Squier (q.v.), obtained a temporary cession to us of Tigre Island, the nearest one to Nicaragua, to block this scheme, pending a formal treaty; shortly afterward the British expedition arrived, and seized Tigre "for debt." Clayton, in great fear lest the popular indignation should force his hand, pushed the treaty through without sufficient insistence on clear definition of the points at issue. It was signed 19 April, and passed the Senate, 42 to 11. Its provisions were that (1) neither power was to have exclusive control over the proposed canal; (2) neither was to fortify the canal or its vicinity; (3) neither was to occupy, fortify, colonize, or have dominion over any part of Central America, either directly or through any "alliance or protection, intimacy, connection, or influence" in or over it; (4) the two powers should mutually guard the safety and neutrality of the canal, and invite all other nations to do the same; (5) they should aid and protect any authorized and reasonably operated canal company; (6) the fifth article (to establish a general principle) should extend also to any other means of isthmic transit.

England did not formally withdraw her Mosquito protectorate, but with the neutralization of the canal it ceased to have any object, and was thought sure to drop. Before the ratifications were exchanged, however, Lord Palmerston wrote to Bulwer that the British government would interpret the treaty as not applying to Honduras "or its dependencies." This could include Mosquitia, and it was Clayton's duty to settle that point before proceeding; but in fear of having his statesmanlike plan wrecked, and confident of no practical evil resulting, he assumed that it referred only to the islands, did not press Bulwer for assent to this construction, concealed the three quoted words from the Senate and the attorney-general, and the ratifications were exchanged 4 July. Great Britain had won a distinct diplomatic victory; she had secured a pledge from the United

States not to occupy any position in Central America, while herself retaining the entire eastern coast of Nicaragua.

2. The ambiguous interpretation of the treaty satisfying neither power, Daniel Webster (q.v.), who succeeded Clayton in 1850, undertook negotiations with Bulwer to modify it; but what each side most desired was what the other would not grant — recognition or abandonment of the bogus Mosquito claim to the mouth of the river. In 1851, to clear up the meaning of the word "dependency," Great Britain occupied Greytown; proclaimed afresh the Mosquito protectorate; and in November one of her men-of-war fired on the American vessel Prometheus for refusing to pay port dues at Greytown. England disavowed this, but the question which Clayton had shirked must be settled. About this time the English had started a project to build a ship railroad across Honduras; and to hold the approaches, their government reoccupied (August 1852) a group of islands off the northern coast, called the Bay Islands, formerly part of Belize. American suspicion once more became hot; and the new Pierce Senate in December ordered an investigation into the way the treaty had been kept, called for the papers, and for the first time found how they had been tricked — not, however, by the English diplomat, but their own. In great wrath, they denounced the occupation of the islands and the Mosquito protectorate as an infraction at once of the treaty and the Monroe Doctrine, and Marcy, now secretary of state, instructed Buchanan, minister to England, to insist on the British evacuation of all English territory in Central America except Belize. Lord Clarendon replied that Belize was not a part of Central America as understood by the treaty; that the Bay Islands were a part of Belize; that the treaty did not refer to Mosquitia, but only prohibited further colonization; and that the Monroe Doctrine was no part of international law. Just then a quarrel between the Mosquito Indians and the American settlement south of Greytown led to a United States gunboat bombing and burning the latter. Then William Walker (q.v.), with the aid of a Nicaraguan faction, became for a time the master of the state, ostensibly in the interest of the United States, whose slaveholding government at last received a representative from his; and the British believed that this country intended to retain possession of Nicaragua. On the other hand, Costa Rican action against Nicaragua was laid to English incitement. Walker continued to make mischief till shot in 1860. Dallas, who succeeded Buchanan, drew up with Clarendon a treaty of 7 Oct 1856, which came to grief on the question of the Bay Islands. In 1857 Buchanan became President, and supported his secretary of state, Lewis Cass, in making a preferential canal treaty with Nicaragua; to which Great Britain objected as violating the Clayton-Bulwer Treaty, and it was not ratified. In the fall of that year, Buchanan announced his intention of proposing an entire abrogation of the treaty and arranging a new one on a satisfactory basis. Lord Napier, now British minister, proposed three alternatives: a mutual abandonment of the treaty and return to the *status quo ante*; submission of the question to arbitration; and the awaiting the issue of treaties pending between Great Britain and the

CLAYTON-BULWER TREATY

Central American states. The last was accepted, and the results were satisfactory enough to prevent further trouble for more than 20 years. The Bay Islands were retroceded to Honduras on condition of not parting with them to any other nation; the Mosquito protectorate was abandoned, and a reservation set up for the Indians by Nicaragua, which was to pay them \$5,000 a year or else the rights reverted to Great Britain; and Greytown became a free port under Nicaraguan sovereignty. The conditional clauses of the renunciation were not pleasing to the United States, and in fact the money was never paid, partly because Nicaragua expected the United States to back its refusal; but on the whole the settlement was accepted as a happy ending to the wrangle. Up to 1880, though the growing sentiment in favor of exclusive United States control of the canal sometimes fretted against the treaty, a host of treaties and other international actions were based upon its validity, and it was more than once appealed to when British acts (as the erection of Belize into the colony of "British Honduras" in 1862) were assumed to violate it.

3. The latent feeling in favor of exclusive control was stirred into active life by the French canal at Panama, and the fear that it would give that nation the military control of Central America. In March 1880 President Hayes sent a special message to Congress enunciating the policy of "an American canal under American control," expanded later into the claim that the banks of the Nicaragua Canal would be a continuation of the United States shoreline. As a result, Congress passed several resolutions recommending the abrogation of the Clayton-Bulwer Treaty. Garfield in his inaugural of 4 March 1881, spoke (though less strongly) in the same strain; the project of a joint European neutralization of the Panama Canal was arousing much American feeling. J. G. Blaine (q.v.), then secretary of state, opened the attempt at an outright repudiation of the treaty. In a circular to the European powers, 24 June 1881, he declared that the United States would in future allow no foreign interference in the control of any isthmian canal, whose neutrality we would ourselves guarantee; and that any European action toward sharing in such guaranty would be held equivalent to an alliance against the United States. Lord Granville, for Great Britain, replied briefly that this matter was already settled by the Clayton-Bulwer Treaty, and his government relied on its observance. Meantime and afterward, 19 and 29 Nov. 1881, Secretary Blaine sent two long arguments of his position to James Russell Lowell, then minister to England. He did not, however, allege that the treaty was null, or commit the country to an open repudiation of it, but complained of it as so contradictory of interpretation, and mutually vexatious, that it ought to be no longer binding under new circumstances. He also asserted that the joint control would be virtually controlled by England, from her superior naval strength. In fact, however, the treaty provided not for a joint control, but a joint refraining from control, and prevention of any other power gaining control. Lord Granville replied by two dispatches of 7 and 14 Jan. 1882, traversing the logical and historical arguments adduced. Garfield's murder led shortly to Blaine's retirement, and F. T. Frelinghuy-

sen's accession to his place. The outcome of further correspondence was, that England would not give up the treaty, and declared that the United States was estopped by its own acts from interfering with it, and that the Monroe Doctrine was a mere assertion of force, having no standing in international law, and had the same place in diplomatic argument as a list of the military or naval forces. Congress and the President (Arthur) were much dissatisfied with this result; and the latter proceeded to draw up a treaty with Nicaragua in flat defiance of the Clayton-Bulwer Treaty. It formed a perpetual alliance between the United States and Nicaragua, whose territorial integrity this country guaranteed; save that the United States was to build a canal and have exclusive control over it, and own in fee simple a strip on each side. The Senate shrunk from this direct repudiation, without stronger cause than yet existed, and refused, 32 to 23, to ratify the new treaty. Mr. Cleveland's accession put a stop to the agitation for many years, as he disapproved of the new movement, preferring a union of the nations in a common protection of what was for their common interest. So far from any attempt being made under his administrations to repudiate the treaty, on two important occasions it was appealed to in protest against acts of Great Britain. The first revival of the feeling of 1880-4 in practical form was in President McKinley's second annual message, December 1898, favoring a canal under American control; and few then doubted that it must be through Nicaragua. The acquisition of new territory and the increase of the navy led many who had been opposed to the movement to change their minds, and favor a canal through which the United States at all times could pass its war vessels, and from which it could exclude its enemies. Others continued to argue that if the country were not superior in naval force it could not maintain that privilege against its enemies, and if it were, could enforce it against them in any event, and that an exclusive control only made the canal the instant mark of our enemies. But the dominant feeling was strongly against the treaty; congressional resolutions declared it void; the press denounced it; and the sentiment was in favor of President Arthur's old scheme of acquiring a strip of land along the canal outright. The British feeling was by no means strong for the treaty, but it preferred a modification by decent diplomatic forms rather than a violent abrogation. To take the movement out of the hands of newspapers and demagogues, the American and British governments hastened to devise a new arrangement which should not throw all old principles to the winds, and a treaty was negotiated by Secretary John Hay on our side and Sir Julian Pauncefote on the other, known as the first Hay-Pauncefote Treaty, signed 5 Feb. 1900, and sent to the Senate. The majority were astonished and indignant, as the new treaty not only did not abolish the old, but proclaimed it in force and binding; adhered to its principles of neutralizing the canal, which were what the growing sentiment wished to reverse; and was in fact only the Clayton-Bulwer Treaty in new and tighter form, in all the points which had become most obnoxious. The "Davis Amendment," proposed in committee, practically nullified the neutrality feature, but neither it nor the main treaty had

CLAYTONIA — CLEARING-HOUSE

been acted upon when the Senate adjourned in June. The period for ratification was extended to 5 March 1901; but the platforms of both parties insisted on exclusive American control. The amendments added to it in the following session of Congress made it unacceptable to Great Britain, which refused to ratify it, and it expired by its own limitation. The two statesmen, however, drew up another, less satisfactory in some respects than the old, and which specifically abrogated the Clayton-Bulwer Treaty, but succeeded in saving its general principles of neutralization (see HAY-PAUNCEFOTE TREATY); and it was ratified 16 Dec. 1901. By the irony of fate, this question of the control of a Nicaragua canal, so burning for half a century, and menacing war more than once, seems to have been dealing with a contingency never to happen, as the entire subject-matter is apparently set aside in favor of the Panama canal.

Clayto'nia, a genus of plants of the purslane family (*Portulacaceæ*), so named in honor of the American botanist John Clayton (q.v.). It is among the earliest and most beautiful of the American wild-flowers, these two qualities giving it its common name of spring beauty. There are at least 25 species, most of them natives of North America. The plants grow in damp woods and wet places, and are found at all elevations up to 5,000 feet, in the region of Nova Scotia, south to the Gulf, and westward to the Pacific coast. *C. perfoliata*, Spanish lettuce, common from British Columbia to Mexico, is used as an anti-scorbutic in household medicine. *C. tuborasa*, a native of Siberia, supplies a root that is eaten by the natives.

Cleanthes, klē-än'thēz, Greek Stoic philosopher of the 3d century B.C. He was a native of Assus, in Lydia, but, visiting Athens, became a zealous disciple of Zeno. In order to attend on that master in the day, he was accustomed to labor by night. His mental and his bodily strength were immense, and despite all obstacles, he studied so successfully as to become Zeno's successor, 263 B.C. Of his writings only some fragments remain, among which is his noble 'Hymn to Zeus.'

Clear, Cape. See CAPE CLEAR.

Clear Lake, a body of water lying in a picturesque region in Lake County, Cal.; 110 miles north of San Francisco. It is 25 miles long, and from two to six miles wide.

Clearance of Vessels, the examination of them by the proper custom-house officers, and the giving of a certificate that the regulations have been duly complied with. Vessels are said to clear inward or outward according as they arrive or depart.

Clearchus, klē-är'kūs, Spartan general who commanded about 13,000 Greeks in the army of Cyrus the Younger when that Persian prince tried to wrest the throne of Persia from his brother, Artaxerxes II. When Cyrus was defeated at Cunaxa (401 B.C.), Clearchus and his chief officers were seized by treachery and put to death.

Clear'field, Pa., the county-seat of Clearfield County, on the Susquehanna River (west branch), and on the Pennsylvania R.R. It is situated in the west-central part of the State, and is surrounded by a rich agricultural region, underlying which are deposits of coal,

fire-clay, and limestone. Its manufactories include flour-mills, tanneries, foundries, and lumber mills. Pop. (1900) 5,081.

Clearing-house, an institution for balancing daily the mutual obligations of a number of banks in a single city, with the least possible transfer of actual cash from "debtor" to "creditor" banks. At a central office the various accounts are canceled against each other on the blanks of the clearing-house, which is thus made the one debtor and creditor of all; and each settles the day's transactions by giving or receiving in a single payment the balance due. Some clearing-houses do not even require cash in the settlement: in London it is made by transfers on the banks' accounts with the Bank of England (which is not a member of the clearing-house); in Philadelphia by United States or clearing-house gold certificates. In one shape or another, however, the final payments must represent gold; this has been so from the foundation of the system, and in every country and every State of the United States. The institution as developed has come to serve other purposes more valuable even than its primary ones; but those relieved a situation vexatious then, and quite incompatible with the volume and character of banking at present. Indeed, in America for many years the need of it was indefinitely greater than where and when it originated — Great Britain, in the latter part of the 18th century. Each bank sent a messenger daily to each of the others, to collect its checks on them and bills payable at them; and the amounts were paid by each to each in cash — Bank of England notes — which the messengers carried back through the streets. This was not only costly and wasteful of time, but involved danger of accident or robbery in transit. In Edinburgh, which claims priority in the clearing-house device, a still more curious reason is alleged: that rival banks accumulated a mass of each others' obligations and presented them in a lump, to break each other. (Something like this actually was done about 1850 by Overend, Gurney & Company to the Bank of England — accumulating a great deposit and withdrawing it all at once — not to bankrupt it, but to frighten it into rescinding a rule not to lend to brokers except at certain seasons.) Hence it was agreed to adjust their claims to date twice a week only. But the first historical appearance of the system is in London. About 1770 the clerks evolved the idea (perhaps from the custom among French merchants of making their bills payable at the annual fair of Lyons, where they mostly canceled each other) of economizing their time and labor by meeting daily in a room and exchanging obligations, settling only for the balance. This obviously enabled on an average one half of the clerks to dispense with their errands, and reduced the needful stock of real money. Many years later a great English bank reduced its reserve of daily cash from £150,000 to nearly nothing by admission to the clearing-house; and the ratio of balances in money to the total obligations in American clearing-houses has varied all the way from 20 per cent down to 3.9 per cent (in New York, where it has never risen to 7). In 1775 a special building in Lombard Street, London, was assigned to this department; at first it was merely a meeting-place of the clerks for ex-

CLEARING-HOUSE

change; but shortly the further step was taken of appointing paid clerks to receive and balance checks and bills. In 1858, on the suggestion of Sir John Lubbock, the system was extended to include the country banks of Great Britain, by means of their London correspondents.

The New York clearing-house was not established till 11 Oct. 1853. The conditions were so bad previous to this, that it is scarcely intelligible how they could have been endured so long. There were 52 banks, each sending messengers back and forth; there was no national currency, and balances had to be paid in gold coin; the labor of counting and carrying this was so onerous that actual transfers of cash were made but once a week, though the accounts were balanced on the pass-books and the bills exchanged daily; and the bags of coin were so heavy and precious that they were often transported in wagons guarded by militia. The average daily clearings for the first year of the New York establishment were \$19,104,594.94, which would have weighed over 70,000 pounds avoirdupois, or 35 tons; in other words, a week's settlements would have demanded 422,486 pounds of coin, or 211 tons. The actual payments in gold were \$988,078.06, a little over 5 per cent. If all the average daily clearings of the United States in 1902 (\$381,650,000) can be imagined paid in coin according to the practice prior to 1853, it would need 1,406,653 pounds, over 700 tons; or if settled weekly, 4,220 tons. Further, the formation of the clearing-house enabled the banks to close 2,500 regular ledger accounts, to be posted up daily. Since then the system has spread to every part of the Union, all the large cities and several minor ones having clearing-houses, and all the leading States having at least one; while the more sparsely settled ones, or those with slightly developed industrial systems, utilize those in the nearest centre. But nearly two thirds of all the clearings in the United States are done in New York, that being the most convenient settling-place of cities with cities. In 1905 the total clearings of the United States were \$140,501,841,957, of which \$91,879,318,369 was in New York, a daily average of \$302,234,600. The balances settled in money were \$3,953,875,975, or 4.33 per cent. The next highest clearings, in order of volume, were in Chicago, Boston, Philadelphia, St. Louis, San Francisco, Baltimore, and Kansas City, Mo., each over \$1,000,000,000 except the last, which was just below it. In 1902 the New York clearing-house had 60 members, besides the assistant treasurer of the United States; and 79 banks and trust companies in the city or vicinity not members used its members as agents.

The methods in different countries and centres are not exactly alike; but the differences in detail are matters of interest to bankers rather than to the public. It is interesting, however, to know that an English expert pronounced the American (New York) system the best. In brief, it is as follows: each bank, before the day's work begins, must have prepared and ready to hand in—first, its checks for collection, made up in as many packages in envelopes as there are bank members of the clearing-house; second, a schedule of its amount due from each; third, a debit ticket to be given to each; fourth, a schedule of its aggregate claim on all the members together for the day, which

goes to the manager or the proof clerk. Each sends two clerks to the clearing-house, a delivery and a settling clerk. The latter sit at desks in rows, the former in front of them, and they assemble at about 9.50. At 9.58 a bell is struck, and any clerk not in place is fined \$2. At 10 it strikes again, and each delivery clerk begins handing his envelopes of checks to the settling clerks in succession as he passes along, at the same time dropping the corresponding debit ticket into a slit in the desk. This takes about 10 minutes; and the proof clerk at his desk enters the claims of each bank against the clearing-house on a "proof sheet," which must show a total the same as that of all the debit tickets put into the desk slits. Next, the settling clerks set down the sums on these tickets, foot them, and pass the total to the proof clerk, who arranges them on his proof sheet with each bank's debit opposite its credit; the difference being the sum due to or from the clearing-house in each case. This takes about half an hour. If accurately computed, the debit and credit columns must foot alike in both cases, as to bank claims and as to clearing-house claims. The manager reads off the balances due, and the settling clerks write them down. At 10.45 the work must be completed, and if errors in the footings prevent the proof being correct, the culprit is fined, with the fines doubled after 11.15 and quadrupled after noon. The balances are paid with gold coin, gold certificates (either of the United States treasury or of the clearing-house against gold in its vaults), or legal-tender notes. In Boston balances are borrowed and lent by members at call, being transferred by a written order on the manager; more than half of them are thus employed, the clearing-house rate of interest being a regular stock quotation. If a bank denies liability on any check presented to it by another member, the clearing-house takes no cognizance of the denial, that being a matter between the banks, to be settled outside. But the clearing-house determines the class of claims to be accepted, and different clearing-houses have different rules.

The strength and the comity of these associations, however, have given them both the power and the disposition to accomplish ends much more momentous than saving money and time in doing business. The power of disciplining their members and deciding on their qualifications is inherent: a majority of the members can expel a member, the Standing Committee can suspend without notice, and the moral power exercised is very great. A fraudulent return to the United States internal revenue commissioner caused the expulsion of one bank; and a watchful lookout is kept on the financial condition of all. The New York clearing-house requires a weekly, the Philadelphia a daily, report on their standing. There is usually an arbitration committee to settle disputes between members. But far more important is the financial strength given by the union of the banks, when they are willing to act together, in checking or preventing "runs" and tiding over panics. That a run on one bank may precipitate runs on others, and in the mad fright thus started pull down a series of perfectly sound banks, is not more obvious now than ever; but for many years there was not sufficient unity of purpose, or confidence in the strength of the others, to enable the stronger or the unimpaired to help the others; and still

CLEARING-NUT — CLEAVELAND

more, it was not seen how this could be done and the others be secured for their advances. Of late years, however, the clearing-houses have acted in this matter with signal success, by means of clearing-house loan certificates. The method is to allow a member bank to turn in its bills receivable or other securities approved by the Loan Committee, with its own note for sums loaned, and be granted in exchange certificates for a large portion of the face value, which shall be accepted as cash in paying clearing-house balances. These bear the highest legal rate of interest, 6 per cent, to operate as a restraint on borrowing more money or retaining it longer than is absolutely needed; and they can be used for no other purpose. The reserves of the member banks are thus made a common treasury; and not only is all the cash at the service of whoever needs it most, but the fact that this is known breaks nine runs out of ten, because people do not wish to take out their money, but only to know that it is safe. The last panic in the United States in which there was a general suspension of the banks was in 1857; and the five panics since then have been prevented from resulting in this largely by the use of these loan certificates; of which in the last panic, that of 1893, over \$40,000,000 were issued. A further use of this combined credit is to aid government action in critical places. The Union would have been repeatedly in most intense embarrassments to maintain its credit but for the banks of the New York clearing-house, which floated its loans and advanced money, and probably prevented a collapse for a time of apparent financial resource.

The clearing-house system is also applied to other business than banking. In England there is a general railway clearing-house, which pools traffic facilities, and the shares of each of the railway companies in through business; has weekly reports of the passenger tickets taken up, and the weight, destination, and payment of through freight; and arbitrates between companies on claims for damages or disputes over liability. In London also there is a stock exchange clearing-house.

Consult: Cannon, 'Clearing-Houses' (1900); White, 'Money and Banking' (1902).

WILLIAM SHERER,
Manager New York Clearing-House.

Clearing-nut, a small tree (*Strychnos potatorum*) of the same genus as the *nux vomica*, the seeds of which are used in India for settling or clearing muddy water. The seeds are rubbed upon the inside of the water-vessel, and within a few minutes after the water has been introduced it becomes clear, the sediment and non-soluble ingredients having sunk to the bottom. The wood is very hard and heavy, and is used for cabinet-making and house-building.

Clearstory. See CLERESTORY.

Clearwing, a small moth with transparent wings, the caterpillars of which are the borers that destroy peach-trees and fruit-bushes. Although common in America they are mostly importations from Europe or Asia.

Cleary, James Vincent, Canadian clergyman: b. Waterford, Ireland, 18 Sept. 1828. He was educated at Royal College, Maynooth, and ordained to the Roman Catholic priesthood in 1851. He became president of St. John's Col-

lege, Waterford, in 1873, and in 1880 was appointed bishop of Kingston, Canada, the see being made an archbishopric in 1889. In 1896 he reopened the Theological Seminary of Regiopolis College in Kingston.

Cleavage, in mineralogy and geology, the mode in which any body may most readily be, or naturally tends to be, split up into fragments. The regular structure of most crystallized bodies becomes manifest as soon as they are broken. Each fragment presents the form of a small polyhedron, and the very dust appears under the microscope an assemblage of minute solids, regularly terminated. In this process common salt and galena break up into small cubes, fluor-spar and the diamond into octahedrons, sulphate of barytes and the topaz into rhomboidal prisms, calcite and other related mineral carbonates into rhombohedrons, etc. The directions in which all those bodies thus break up are called their planes of cleavage. It must not be supposed, however, that all inorganic crystallized substances possess this property. Several of them break up only into irregular fragments, as the rock-crystal, the garnet, the emerald, etc. In others the cleavage is only in two directions, and sometimes only in one, and consequently produces no regular solid. Cleavage often indicates the different bodies which belong to the same system of crystallization, or distinguishes between those which belong to different systems, even when their external forms happen from any cause to be disguised or destroyed. The term is employed by geologists in a somewhat different sense, and applied to non-crystallized bodies, as clay-slate. In this sense it means the tendency of rocks to split along planes which either coincide with the original plane of stratification or may cross it at any angle up to a right angle. This tendency is the consequence of the readjustment (by pressure and heat) of the components of rocks. See PHYSICAL CRYSTALLOGRAPHY: MINERALOGY.

Cleaveland, klēv'land, **Moses**, American pioneer: b. Canterbury, Conn., 29 Jan 1754; d. there 16 Nov. 1806. He was graduated at Yale in 1777, and began the practice of law in his home town, being several times elected to the legislature, and in 1796 commissioned a brigadier-general of militia. He was a leading shareholder in the Connecticut Land Company which had bought for \$1,200,000 the land in northeastern Ohio reserved to Connecticut by Congress, and subsequently known as the Western Reserve. In 1796 Cleaveland went out with a party of 50 to survey the tract and arrange for its settlement by white emigrants. After successfully negotiating with the Indians who claimed certain rights to the region, the party arrived at the present site of Cleveland, 22 July 1796. Cleaveland immediately chose it as a place for his settlement, surveyed it into town lots, and the members of the party named it Cleaveland in his honor. In 1830, when the *Cleveland Advertiser* was founded, the headline was found too long for the form, the editor therefore dropped the letter "a" in the first syllable of the city's name, and the new spelling of Cleveland was soon generally adopted.

Cleaveland, Parker, American mineralogist: b. Rowley, Mass., 15 Jan. 1780; d. Brunswick, Me., 15 Oct. 1858. He graduated at Harvard 1799, and was appointed tutor there 1803.

CLEAVERS — CLEFT PALATE

In 1805 he was chosen first professor of mathematics and natural philosophy at Bowdoin College. Applying himself with energy to the new sciences of chemistry and mineralogy, his studies resulted in a treatise on 'Mineralogy and Geology' (1816; 2d ed. 1822; 3d ed. 1856), which brought him the offer of the chair of mineralogy in Harvard, which he declined, as he likewise did the presidency of Bowdoin in 1839. He stood first in his subject in this country, was a popular and lucid lecturer, an enthusiastic and inspiring teacher. When the medical school was founded at Bowdoin in 1820 he was made its dean and librarian.

Cleavers, one of the 70 common names applied to certain species of goose-grass (q.v.), of the madder family, occurring throughout the whole United States; troublesome weeds, probably naturalized from Europe. Other names by which they are known are catchweed, beggarlice, burhead, clover-grass, cling-rascal, scratch-grass, wild hedge-burs, stick-a-back or stickle-back, gosling-grass, gosling-weed, turkey-grass, pigtail, grip or grip-grass, loveman, and sweet-hearts. They are as common in Europe as in America, and seem to be useless except in Sweden, where for many years their prickly stems have been used as strainers for milk. Cleavers was formerly of repute in household medicine as a diuretic, but is now so used only in the most remote settlements.

Cle'burne, Patrick Ronayne, American soldier: b. Cork County, Ireland, 17 March 1828; d. Franklin, Tenn., 30 Nov. 1864. While a student at Trinity College, Dublin, he ran away and enlisted in the English army, in which he served for three years. He came to America, settled in Helena, Ark., studied law, and practised successfully until the Civil War. Joining the Confederate army as a private, he rose rapidly to a brigadier-generalship, commanded a brigade at Shiloh, was wounded at Perryville, and commissioned major-general, December 1862. He distinguished himself greatly in many fierce engagements, notably at Murfreesboro, Chickamauga, Ringgold Gap, and Missionary Ridge, receiving the thanks of the Confederate Congress. He was killed at the battle of Franklin, after carrying two lines of Union works, and shortly after saying to Gen. Hood: "I have more hope in the final success of our cause than at any time since the first gun was fired." He was a soldier of quick perception and strong character, and early and boldly advocated freeing the slaves, and the enlistment of the young and able-bodied negroes in the Confederate service. He was called the "Stonewall of the West," and instituted the Order of the Southern Cross.

Cle'burne, Texas, the county-seat of Johnson County, on the Gulf, C. & S. F. R.R., whose division offices and shops are located in the town. It is a distributing centre for a large agricultural region, and has flour-mills, machine-shops, and cotton-gins. Pop. (1900) 7,493, being more than double that of 1890, when it had a population of 3,278.

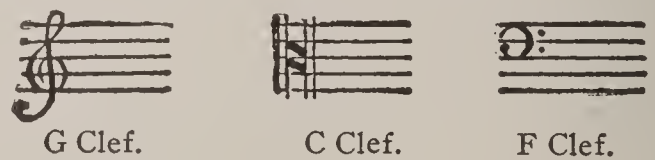
Cleckheaton, klĕk'hĕ'-tūn, England, a town in the county of York, West Riding, situated on a declivity in the Spen Valley, 10 miles west of Leeds. It is well built, lighted with gas, and has a technical institution, handsome premises belonging to the co-operative association, a fine town-hall, and three large and

beautiful churches. The industries include the worsted and machine-card trades, machine-making, engineering works, etc., and coal is mined in the neighborhood. Pop. (1901) 12,523.

Cleef, klāf. 1. **Joost (yoost-) VAN**, called Zotte (crazy) Cleef: b. Antwerp 1480; d. 1529. He was one of the most celebrated painters of his time, and in regard to beauty of coloring may challenge comparison with the most distinguished Italian masters. His excessive vanity and eccentricity caused him to be described as "mad." 2. **JAN (yān) VAN**, a painter: b. Venloo, Guelderland, 1646; d. Ghent 1716. He was a pupil of De Cræyer, and belongs to the Flemish school, of which he is one of the most eminent masters. His works, which resemble those of Poussin, are particularly remarkable for beauty of design and coloring. The churches of Ghent are adorned with many of his paintings, in which the heads of children and the countenances of women are very beautiful.

Cleeve, Lucas, English author; daughter of Sir Henry Wolff, and wife of Col. Howard Kingscote. She has traveled widely and has published: 'Tales of the Sun'; 'English Baby in India'; 'Life of Eugenie Berni'; 'In the Ricefields'; 'Woman Who Wouldn't' (1895); 'Lazarus'; 'Epicures' (1896); 'Water Finder'; 'The Monks of the Holy Tear' (1898); 'Plato's Hand-Maiden'; 'The Real Christian' (1901); 'Blue Lilies' (1902); 'Anglo-Americans' (1903).

Clef (Fr. for key), a character placed at the beginning of a staff to show the elevation of that particular staff in the general claviary or system, and to determine the names of the notes according to their positions on the staff. There are three Clefs; the G Clef, generally known as the treble Clef, which is placed on the second line of the treble staff; the C Clef, which is used either as the alto, tenor, or (rarely), soprano Clef, according to its posi-



tion on the third, fourth, or first line of the staff; and the F Clef, which is either base or baritone (rare) Clef, according to its position on the fourth or third line of the staff.

Cleft Palate, a fissure of greater or less extent existing in the roof of the mouth, extending in some instances through the jaw, the hard and the soft palate, even to the end of the uvula. Both congenital and acquired forms of cleft palate are known, but the congenital variety preponderates. It seems to be a family trait, and is much more common in Hebrews than in other peoples. Cleft palate is due to a lack of union of the intermaxillary and the supramaxillary bones. These normally join to make the bony roof of the mouth, but they sometimes fail to unite on either side of the middle line. If such failure to unite occurs on one side only, unilateral cleft palate and hare-lip results; if the developmental failure occurs on both sides bilateral cleft palate and hare-lip are produced. Very often there is only a slight depression on the edge of

CLEISHBOTHAM — CLEMENS

the lip, showing that the soft parts have not united as they should. This constitutes the simplest form of hare-lip and is not associated with cleft palate. In cases of severe cleft palate food regurgitates through the nose, and swallowing is impossible. In these cases, children are apt to die of inanition unless surgical procedures are used to repair the defect. Modern surgery has evolved a number of plastic operations with a view to obviate these congenital mal-developments, and treatment is very satisfactory. Consult 'American Text Book of Surgery' (Phila., 1903).

Cleishbotham, klēsh'bōth-am, **Jedediah**, a character in Scott's 'Tales of My Landlord,' who is represented to have collected the stories, of which Peter Pattieson is the imaginary writer.

Cleisthenes, klīs'thē-nēz, or **Clisthenes**, an Athenian politician who flourished about 500 B.C. He was the grandson of Cleisthenes of Sicyon, and the son of Megacles, and at the end of the rule of the Pisistratidæ (510 B.C.) was a leader of their enemies. When, with the assistance of the Delphian oracle and the Spartans, Hippias was banished from Athens, Cleisthenes, in order to secure his ascendancy over his rival Isagoras, chose to defend the cause of the people and succeeded in introducing some important changes in the ancient constitution of Athens; among others, the division of Attica into 10 instead of 4 tribes, each consisting of several *demi*, under demarchs; the increase of the number of the senators from 400 to 500, 50 of each tribe; and, as some say, the law of ostracism (q.v.), so remarkable in the history of that state. Cleisthenes, being suspected of the desire of tyrannical power, was himself banished, but afterward returned and triumphed over his enemies.

Clélie, klā-lē, a romance in 10 volumes by Mademoiselle de Scudéry, published in 1656. The subject is the siege of Rome after the expulsion of Tarquin the Proud, and the heroine is the young Roman girl who was a hostage of Porsena, and swam across the Tiber to escape from him. The manners and language assigned the Roman characters in the romance are utterly ridiculous and grotesque, but if we consider the Romans as disguises for the fashionable people of the 17th century, the pictures of life are true to nature.

Clemanges, **Mathieu Nicolas**, mā-tè-è nīk-ō-lā klā-mānzh, French theologian: b. Clemanges 1360; d. about 1430. He studied at Paris under Pierre d'Aille and Gerson. In 1391 he was professor of theology at the University of Paris, and in 1393 became rector there. In the hope of helping to heal the Papal Schism of the time, he accepted the position of private secretary to Benedict XIII., the anti-pope at Avignon; but when Benedict excommunicated the French king in 1407 Clemanges resigned his office and lived in voluntary exile with the Carthusian monks. Here he devoted himself to his studies and writing, endeavoring to correct abuses in the Church, and seeking to place the study of theology upon a wider basis: his writings had much influence on the deliberations of the Council of Constance. In 1425 he went back to the University of Paris, where he continued to lecture until his death. His works were collected and published by Lydius (1613).

Clematis, a genus of climbing vines or ascending herbs, of the crowfoot family (*Ranunculaceæ*). It numbers upward of 100 species, and is widely distributed throughout the temperate regions of the world. In the United States between 20 and 25 species are recognized. The best known is the virgin's-bower (*C. virginiana*), a vine that climbs over shrubs and along fences, from Nova Scotia to Georgia, and west to Kansas and Manitoba, its sprays of white flowers making a showy appearance from July through September. Other species are found west of the Mississippi River, extending to the Pacific coast, and south to the Gulf of Mexico. The only English species is called traveler's joy (*C. vitalba*). Rare foreign species are to be found in gardens, and culture and hybridizing have produced varieties that, escaping from gardens, add new species to the wild representatives of the genus.

Clémenceau, **Eugène**, è-zhān klā-mōñ-sō, French politician: b. Moulleron-en-Pareds 28 Sept. 1841. He studied medicine at Paris, and began the practice of his profession there. He became active in politics, joining the radical party, and in September 1870 was elected mayor of the 18th Arrondissement (Montmartre). Not being an extreme radical, he tried to bring about a reconciliation between the Commune and National Assembly, but failing in this, resigned his office as mayor. In 1871 he was a member of the Municipal Council; in 1876 he was elected to the Chamber of Deputies, and became the leader of the Radical Republicans. He was implicated in the Panama Canal scandals in 1892, and failed of re-election in 1893. He is editor of the radical journal 'La Justice.' In 1902 he was elected to the Senate, later became Minister of the Interior, and in 1906 Premier.

Clemens, **Jeremiah**, American politician: b. Huntsville, Ala., 28 Dec., 1814; d. there 21 May 1865. He graduated at the University of Alabama 1833, studied law at Transylvania University, Ky., and was admitted to the bar, 1834. He was United States attorney for the northern district of Alabama 1838; a member of the State legislature 1839-41, 1843-4; in 1842 raised a company of volunteer troops and went to Texas, having been appointed lieutenant-colonel, and subsequently held the same rank in the regular service. In 1848 he was governor of the civil and military department of purchase in Mexico, holding the position until the end of the war. He was a United States senator 1849-53, and held high rank as an able and eloquent debater. He took part in the Alabama secession convention, and though protesting against its action, subsequently yielded and held office under the Confederacy. In 1864 he advocated Lincoln's re-election. He wrote several novels which were popular in their day: 'Bernard Lyle' (1853); 'Mustang Gray' (1857); 'The Rivals: a Tale of the Times of Aaron Burr and Alexander Hamilton' (1859); 'Tobias Wilson' (1865), a story of the Confederacy. He left in manuscript an unfinished history of the war in northern Alabama.

Clemens, **Samuel Langhorne**, American humorist; more generally known by his pseudonym MARK TWAIN: b. Florida, Mo., 30 Nov. 1835. He received only a scanty school educa-

CLEMENT

tion, and in 1848 became apprentice to a printer, subsequently working at this trade in Philadelphia, New York, and elsewhere. He afterward learned the business of pilot on the Mississippi, but left this occupation to become secretary to his brother, who had been appointed secretary of Nevada Territory. He then tried his fortune at the Nevada mines. In 1862 he became local editor of a newspaper in Virginia City, but soon went to San Francisco, where he was for some time a reporter. After meeting with slight success in the Calaveras gold-diggings he returned to journalism in San Francisco. In 1866 he went to the Sandwich Islands, and on his return commenced his lecturing career. A trip to the Mediterranean, Egypt, and Palestine followed. He edited for a time a newspaper in Buffalo, and soon after married and settled in Hartford, Conn. He has traveled widely, and many of the scenes and incidents in his works are drawn from his journeys. He lost heavily through the failure of a publishing house which he founded in 1884.

Among his chief books are 'The Jumping Frog' (1867); 'The Innocents Abroad' (1869); 'Roughing It' (1873); 'The Gilded Age' (with Warner) (1873); 'Adventures of Tom Sawyer' (1876); 'A Tramp Abroad' (1880); 'Life on the Mississippi' (1883); 'Huckleberry Finn' (1885); 'A Yankee at the Court of King Arthur' (1889); 'The American Claimant' (1892); 'Tom Sawyer Abroad' (1894); 'Puddinhead Wilson' (1894); 'Joan of Arc' (1896); 'More Tramps Abroad' (1897); 'The Man That Corrupted Hadleyburg' (1900); 'Following the Equator' (1901).

Clemens, Will M., American author: b. Paris, O., 16 Jan. 1860. Educated at Buchtel college; entered journalism at 16 and for 20 years was engaged on the leading newspapers of New York and San Francisco. Among his published works are 'Depew Story Book' (1898); 'Life of Theo. Roosevelt' (1899); 'A Ken of Kipling' (1899); 'Life of Admiral Dewey' (1900); 'Hasty Pudding Poems' (1901); 'The Gilded Lady', a novel (1903).

Clem'ent I. (CLEMENS ROMANUS), Pope and martyr and one of the apostolic fathers. By Irenæus he is reckoned the third in the line of the bishops of Rome, and Origen holds him to be the same Clement who is named by the Apostle Paul in his letter to the Philippians, iv. 3. Tradition declares that he suffered martyrdom in the reign of Trajan and that his term of episcopate extended from 93 to 101; his day in the Roman calendar is 23 November. There is extant a letter from the Church of Rome to the Church of Corinth now generally accepted as having been written by this Clement: A bishop of Corinth, Dionysius, writing about 166 to a later Pope mentions Clemens Romanus as its writer.

Clement II., Pope. He was a native of Saxony and succeeded to the papal chair in 1046 on the abdication of Gregory VI. He was the earliest of the six German pontiffs.

Clement III., Pope: b. Rome; d. March 1191. He was elected pope in 1187, and preached the third crusade against the Saracens. There was an anti-pope with this title, who died in 1100.

Clement IV. (GUY FOULQUES, gē fook), Pope: b. St. Gilles, France; d. Viterbo 29 Nov. 1268. He became pope in 1265, succeeding Urban IV., and was the friend and protector of Roger Bacon.

Clement V. (BERTRAND D AGOUST, bër-trän dä-goost), Pope: b. Bordeaux 1264; d. Roquemaure, Languedoc, 20 April 1314. He became pope in 1305 and at the time of his election was archbishop of Bordeaux. He transferred his see from Rome to Avignon, and thus commenced "the Babylonish captivity" of the Church, which lasted about three quarters of a century. Another memorable event of his reign was his bull suppressing the order of the Knights Templar, 1311.

Clement VI. (PIERRE ROGER, pēär rō-zhā,) Pope: b. near Limoges, France, 1292; d. Ville-neuve d'Avignon December 1352. He succeeded Benedict XII. in 1342 and made an attempt to bring about a reunion of the Latin and Greek churches.

Clement VII. (GIULIO DE MEDICI, joo'-lē-ō dā mā'dē-chē), Pope: b. Florence about 1475; d. Rome September 1534. He succeeded Adrian VI. in 1523. Having by his joining in league with the French king incurred the hostility of the Emperor Charles V., the constable Bourbon, with the connivance of the emperor, invaded the papal territory with an army and sacked the holy city and held the Pope a prisoner for six months.

Clement VIII. (IPPOLITO ALDOBRANDINI, ip-pōl'ē-tō ä-l-dō-brän'dēn), Pope: b. Fano, Italy, 1536; d. 5 March 1605. Succeeded Innocent IX, 1592, reconciled Henry IV. to the Church and ordered the execution of Giordano Bruno. The anti-pope Clement VIII resigned, 1429 but did not close the the western schism.

Clement IX. (GIULIO ROSPIGLIOSI, joo-lē'ō rōs-pē-lē-ō'sē), Pope: b. Pistoia 1600; d. 9 Dec. 1669. He followed Alexander VII. to the papal chair in 1667. In his pontificate was arranged the "Pax Clementina," which for a time closed the Jansenist controversy.

Clement X. (EMILIO ALTIERI, ā-mēl'ē-o ä-l-tē-ā'rē), Pope: b. Rome 13 July 1590; d. 22 July 1676. At nearly 80 he succeeded Clement IX. and during his pontificate a notable controversy arose with Louis XIV. relating to the enjoyment, during vacancy, of episcopal revenues and the right of filling such vacancies.

Clement XI. (GIOVANNI FRANCESCO ALBANI, jō-vän'nē frän-chēs'kō ä-l-bā'nē), Pope: b. Pesaro, Italy, 22 July 1649; d. 19 March 1721. He was elected successor of Innocent III. in 1700, and in 1713 sent forth the celebrated bull 'Unigenitus' in condemnation of Quesnel's treatise on Grace and Predestination. The bull was opposed by the Jansenists, but approved by the Jesuits. The pretender in his efforts to obtain the English crown in 1715 was supported to some extent by Clement. See Lafiteau, 'Vie de Clément XI.' (1752).

Clement XII. (LORENZO CORSINI, lō-rënd'-zō kōr-sē'nē), Pope: b. Florence 1652; d. 6 Feb. 1740. He was the successor of Benedict XIII. in 1730, and was the first pontiff to oppose Freemasonry.

CLEMENT — CLEMENTINES

Clement XIII. (CARLO DELLA TORRE REZZONICO, kār'lō dēl-lā tōr'rā rēt-sō-nē'kō), Pope: b. Venice March 1693; d. February 1769. He succeeded Benedict XIV. in 1758. He published a bull in behalf of the Jesuits after their expulsion from France and Spain in 1767.

Clement XIV. (GIOVANNI VINCENZO ANTONIO GANGANELLI, jō-vān'nē vēn-chēnd'zō āntō'nē-o gān-gā-nē'l'lē), Pope: b. Saint Arcangelo, near Rimini, Italy, 31 Oct. 1705; d. 22 Sept. 1774. He was a Franciscan friar, a man of great piety and worth; the friend and confidant of Benedict XIV. He was elected Pope in 1769 after a struggle in the conclave in which cardinals influenced by various of the Catholic powers made interest in favor of the suppression of the Society of Jesus. When the new Pope showed an unwillingness to do the will of the powers the charge was made that he had received the support of many members of the conclave upon his promise to suppress the order; but this charge has been conclusively proved to be without foundation in fact; yet such was the urgency of the powers, he felt himself constrained in the interest of peace and of the Church to disband the Jesuit order which he did in the apostolic brief *Dominus ac Redemptor* which declares the Society of Jesus dissolved forever. The fact that the brief had been drawn up and completed in November 1772, but was not published till July 1773 is proof that he was loth to publish so severe a decree against the order. After its issue he fell into a rapid decline, presumably from remorse, and though all his life he had been exceedingly vigorous, died little more than 12 months after the brief was published. It was this pontiff who founded the Clementine Museum in Rome. See Caraccioli, 'Vie de Clément XIV.' (1775); Theiner, 'Geschichte des Pontificats Clements XIV.' (1853).

Clément, Jacques, zhāk klā-môn, French assassin: b. Sorbon, France, about 1565; d. Saint Cloud, 1 Aug. 1589. He was a Dominican monk, and the fanatical tool of the Dukes of Mayenne and Aumale and the Duchess Montpensier. Having fatally stabbed the king, Henry III., he was at once killed by the courtiers.

Clem'ent, William Henry Pope, Canadian lawyer: b. Vienna, Ont., 13 May 1858. He was graduated at Toronto University in 1878, and became a lawyer in 1880, practising with success in Toronto. He has written: 'The Law of the Canadian Constitution' (1892), a work that was made a text-book in the principal colleges and universities of the Dominion.

Clement of Alexandria, Saint (CLEMENS ALEXANDRINUS), Greek theologian, one of the most eminent and learned of the fathers of the Church. Very little, almost nothing, is known regarding his life. The first mention of him by a writer living in or near his time is made by Eusebius of Cæsarea and by Photius; they give his name as Flavius Titus Clemens, and later writers add to the name the designation Alexandrinus, "of Alexandria." From his names and surname one might infer that he was of Latin race; but he wrote in Greek, and his writings do not indicate any special acquaintance with Roman life or thought. Whether he was a native of Alexandria or of some Grecian city cannot be decided.

He was a convert from paganism and had an intimate acquaintance with the literature of Grecian philosophy, but of the circumstances of his conversion to Christianity, we know nothing. He was supposably a disciple of Pantænus, director of the Catechetical school of Alexandria and became his successor, and had among his pupils Origen, who in turn succeeded him. Further, Clement was a priest of the church of Alexandria. A list of his writings is given by Eusebius, St. Jerome, and Photius. It contains the titles of ten separate works, namely: 'Hortatory to the Greeks'; 'The Tutor'; 'The Stromates' (usually called *Stromata*): this as its title indicates is a patch-work or collection of miscellaneous observations; 'Who is the Rich Man that is Saved?' These four works have come down to us complete or nearly so. The remaining six titles are of works that have been lost: 'Outlines'; 'On the Passover'; 'On Fasting'; 'On Slander'; 'Exhortation to Patience'; 'The Church Rule.' The 'Hortatory to the Greeks' exposes the absurdities and immoralities of the pagan religions; but the Grecian philosophers and poets had a notion of the true author of the universe. 'The Tutor' sets forth the rule of Christian living. 'The Stromates' is a miscellany but it consists of the author's own studies of questions and problems in philosophy, literature, history, etc., not of passages taken from other authors. The treatise on the Rich Man is a very judicious exposition of the passage in the Gospel of Mark x. 17-31.

Clementi, Muzio, moot'sē-ō klā-mēn'tē, Italian pianist and composer: b. Rome 1752; d. Evesham, England, 10 March 1832. As early as his 12th year he wrote a successful mass for four voices, and had made such progress in the pianoforte that an Englishman, Mr. Beckford, took him to England to complete his studies. He was then engaged as director of the orchestra of the opera in London, and his fame having rapidly increased, he went in 1780 to Paris, and in 1781 to Vienna, where he played with Mozart before the emperor. In 1784 he repeated his visit to Paris, but after that remained in England till 1802, when he went back to the Continent. He returned in 1810 to England, where he settled down as superintendent of one of the principal musical establishments in London. His most important compositions were his 60 sonatas for the pianoforte and the great collection of studies known as the "*Gradus ad Parnassum*," a work of high educative value. He represented perhaps the highest point of technique of his day, and his influence on modern execution has led to his being characterized as "the father of pianoforte playing." He was interred in Westminster Abbey.

Clem'entines, so named after Pope Clement V., who during his pontificate (1305-14) had compiled the canons of the Church, chiefly out of the canons of the 15th Council of the Church, Vienne (1311). The Clementines are one of five great collections of Church laws, examined and decided upon according to the methods employed by ecclesiastical authority. The five collections are known as: The Decretals (1234); the Sext (1298); the Clementines (1313); the Extravagantes of John XXII.; and the Extravagantes Communes (containing Decretals of 25 popes) (1484). Out of these five the 'Corpus Juris Ecclesiastici' is made up.

CLEMSON AGRICULTURAL COLLEGE — CLEOPATRA

Clemson Agricultural College, an educational (non-sectarian) institution in Clemson College Station, S. C.; organized in 1890; reported at the end of 1905: Professors and instructors, 43; students, 673; volumes in the library, 11,380; productive funds, \$154,439; income, \$150,549; number of graduates, 335; president, Patrick Hughes Mell, Ph.D.

Cleobis (klē'ō-bīs) and **Biton**, bī'tōn, two Grecian youths, the sons of Cydippe, chief-priestess of Hera (Juno) at Argos. At the *Heraia*, a feast in honor of the goddess, it was customary for the chief-priestess to be drawn by two white oxen. Herodotus relates that on one occasion the procession had already begun to move, and the oxen had not arrived, upon which Cleobis and Biton drew the chariot of their mother for a distance of 45 stadia, up the mountain where the Temple of Hera stood. The people applauded, and the mother was so affected by this instance of filial affection that she begged the goddess to grant her sons the best gift which could be conferred on mortals. While the youths were yet in the temple a soft sleep fell upon them, and they never awoke. The Argives placed the statues of Cleobis and Biton in the temple at Delphi, and in a temple at Argolis they were represented drawing a chariot of their mother.

Cleobulus, klē-ō-bū'lūs, one of the Seven Wise Men of Greece. He was a native of Lindus, or according to some, of Caria, and flourished 560 B.C. He traveled to Egypt to learn wisdom, like many of the sages of Greece. He was king of Rhodes, and was succeeded on the throne by his daughter Cleobulina. Several of his sayings are extant.

Cleombrotus, klē-ōm'brō-tūs, an ancient Greek military leader, son of Pausanias, king of Sparta. During his reign began the Theban war, in which he commanded the Spartans against Epaminondas and Pelopidas. He was killed in the battle of Leuctra, which happened 8 July 371 B.C., according to the Julian calendar. See EPAMINONDAS.

Cleome, klē-ō'mē, a genus of plants, herbs, and shrubs of the caper family, (*Capparidaceæ*), comprising about 75 species, natives of tropical America and Africa. Less than ten species are found in the United States, most of them adventitious additions from South America, escaped from gardens. The native varieties belong to the Rocky Mountain region, and when found to westward are naturalized specimens. Pink cleome (*C. serrulata*) has a stem from two to three feet in height, the pinkish-white flowers very showy and attractive. Its native location is the Rocky Mountain region from Canada to Arizona and Mexico, but it extends eastward to Lake Michigan. The spider flower (*C. spinosa*) of the eastern seaboard, from New Jersey to Florida, is a South American species escaped from culture.

Cleomedes, klē-ō-mē'dēz, ancient Greek author. He wrote a treatise, in two books, 'On the Circular Theory of the Heavenly Bodies,' which sets forth the Stoic theory of the universe, and which is remarkable as containing, amid much error and ignorance, several truths of modern science — such as the spherical shape of the earth. Nothing is known definitely regarding his life, but it seems most probable that he flourished in the 2d century A.D.

Cleomenes, klē-ōm'ē-nēz, the name of three kings of Sparta, the most distinguished of whom is Cleomenes III., king from 236 to 220 B.C. He distinguished himself in a war against the Achæans. Returning to Sparta he put to death the ephori, made a new division of lands, introduced again the old Spartan system of education, and bestowed the full franchise upon many who had not before had it. He lived very simply, was just and friendly, and treated his enemies with generosity. He showed himself an able general in a war against the Macedonians and Achæans united, but at last lost the important battle of Sellasia (222 B.C.). He fled to Egypt, where he attempted to raise an insurrection, but finding no supporters committed suicide. With Cleomenes expired the race of the Heraclidæ which had sat on the throne of Sparta.

Cleomenes, or The Spartan Hero, a play by Dryden, acted in 1692.

Cleon, klē'ōn, Athenian demagogue, killed at Amphipolis, Macedon, 422 B.C. He was a tanner by trade, but became well known in public affairs before the death of Pericles. By the year 427 he was high in favor with the people, and distinguished himself by the atrocious proposal that all the adult males of the revolted Mytileneans should be put to death, and the women and children sold for slaves. In 425 he took prisoners those Spartans who had been blockaded by an Athenian force in the island of Sphacteria. The next year Aristophanes attacked him in his comedy of the 'Knights' — as he did also in the 'Wasps' in 422 — satirizing his venality, rapacity, ignorance, violence, and cowardice. The portrait was probably correct in the main. In 422 he was sent to Chalcidice against Brasidas, who was capturing the Athenian tributary cities there. He was taken unawares by a sally of Brasidas, and was slain.

Cleopatra, klē-ō-pā'trā, the name of several Egyptian princesses, of whom the most renowned was the eldest daughter of Ptolemy Auletes: b. 69 B.C.; d. 30 B.C. With her eldest brother Ptolemy she shared the throne of Egypt. Both were minors at the death of their father, and were placed under the guardianship of Pothinus and Achillas, who deprived Cleopatra of her share in the government 49 B.C. She went to Syria, and was forming plans for obtaining her rights by force, when Cæsar came to Alexandria, and captivated with her charms, successfully seconded her claims. Pothinus stirred up a second revolt, upon which the Alexandrian war commenced, in which the elder Ptolemy lost his life. Cæsar proclaimed Cleopatra queen of Egypt; but she was compelled to take her brother, the younger Ptolemy, who was only 11 years old, as her nominal husband and colleague on the throne. Cæsar continued some time at Cleopatra's court. The queen subsequently made a journey to Rome, where Cæsar received her magnificently, and erected a statue to her next to the statue of Venus, in the temple consecrated to that deity. Cleopatra remained in Rome from 46 B.C. to 44 B.C., returning to Egypt after Cæsar's death. She had by Cæsar a son, Cæsarion, afterward put to death by Augustus. When her brother, at the age of 14, demanded his share in the government Cleopatra poisoned him, and re-

CLEOPATRA'S NEEDLES

mained sole possessor of the regal power. During the civil war in Rome she took the part of the triumvirs, and after the battle of Philippi she sailed to join Antony at Tarsus. She was then 25 years old, and combined with extraordinary beauty, great wit and the highest elegance of manners. She appeared in a magnificently decorated ship, under a golden canopy, arrayed as Venus, surrounded by beautiful boys and girls, who represented Cupids and Graces. Her meeting with Antony was attended by the most splendid festivals. After having accompanied him to Tyre she returned to Egypt. Antony followed her, and gave himself up to the most extravagant pleasures. She accompanied him on his march against the Parthians, and when he parted from her on the Euphrates he bestowed Cyrene, Cyprus, Cœlosyria, Phœnicia, Cilicia, and Crete on her, to which he added part of Judea and Arabia at her request. On her account he divorced his wife Octavia. After this Antony conquered Armenia, returned triumphantly to Egypt, and made his three sons by Cleopatra, and also Cæsarion, kings.

Now commenced the war between Augustus and Antony, but instead of acting promptly against his adversary, Antony lost a whole year in festivals and amusements with Cleopatra at Ephesus, Samos, and Athens, and at last determined to decide the contest by a naval battle. At Actium the fleets met. Cleopatra, who had brought Antony a reinforcement of 60 vessels, suddenly took to flight, and thus caused the defeat of her party; for Antony, as if under the influence of frenzy, immediately followed her. They fled to Egypt, and declared to Augustus that if Egypt were left to Cleopatra's children they would thenceforth live in retirement, but Augustus demanded Antony's death, and advanced toward Alexandria, which Antony hastened to defend. Cleopatra determined to burn herself with all her treasures, but Augustus pacified her by private messages. These communications, however, did not remain concealed from Antony, who, supposing Cleopatra treacherous, hastened to her, to avenge himself by her death. She, however, escaped and took refuge in the mausoleum which she had erected near the Temple of Isis, and caused the report of her suicide to be circulated. Antony now threw himself upon his sword; but before he expired was informed that Cleopatra was still living, upon which he caused himself to be carried into her presence, and breathed his last in her arms. Augustus succeeded in getting Cleopatra into his power. She still hoped to subdue him by her charms, but her arts were unavailing, and becoming aware that her life was spared only that she might grace the conqueror's triumph, she determined to escape this ignominy by a voluntary death. According to the generally received account of her death she ordered a splendid feast to be prepared, desired her attendants to leave her, and put an asp, which a faithful servant had brought her, concealed amongst flowers, on her arm, the bite of which caused her death almost immediately. There is, however, some doubt as to the exact method by which she took her life. Her body was interred near that of Antony. At the time of her death she had reigned 22 years.

Cleopatra's Needles, two obelisks, formerly at Alexandria, one of which is now in New York, the other in London. They are made of the rose-red granite of Syene, and were originally erected by the Egyptian king Thothmes III., the most celebrated king of the 18th dynasty, in front of the portico of the great temple of Heliopolis, the On of the Scriptures, and the place where Moses was born and brought up. From Heliopolis the two obelisks were removed to Alexandria not long before the commencement of the Christian era, but not, so far as we can now tell, during the lifetime of Cleopatra. We are at least informed by an inscription on the bronze supports of one of them, that they were not erected at Alexandria till the eighth year of the reign of Augustus Cæsar, and accordingly seven years after the death of Cleopatra. How, then, they came to be called Cleopatra's Needles is not apparent; but it may be conjectured that they had been removed by her order some time before they were set up on their second site, or that their removal was the carrying out of an intention formed by Cleopatra. Mr. (afterward Sir) Erasmus Wilson, to whom the credit may be awarded of having been chiefly instrumental in getting the British obelisk conveyed to London, assumes that the association of Cleopatra's name with the two obelisks represents the popularity of the queen and the affectionate regard of her subjects, rather than any participation of herself in their transport or erection. The obelisk now at London lay for a long time prostrate in the sand. In 1820 it was presented by Mehemet Ali to the British nation, but the British government, in spite of many appeals made to them on the subject, never did anything for its removal, which was at last effected solely through the public spirit of several private individuals, the obelisk being erected on the Thames Embankment in 1878. The other obelisk was presented to the United States by the Khedive of Egypt, and was transported to Central Park, New York, where it was erected in 1881. It stands upon four bronze crabs, reproductions of the original crabs upon which the obelisk formerly stood. The originals are now in the Metropolitan Museum, New York. The one in London is somewhat the taller of the two, being 68 feet 5½ inches in height, as against 67 feet 2 inches, the height of the other. The lateral measurements at the base are, in the British obelisk, 7 feet 5 inches in one pair of opposite sides, and 7 feet 10½ inches in the other pair; in the one in New York, 7 feet 9¾ inches, and 8 feet 2¼ inches. The weight of the British obelisk is rather more than 186 tons, and its mass 2,529 cubic feet. Both obelisks are inscribed with hieroglyphs, engraved to a depth of several inches and carefully polished. The hieroglyphs are inscribed in vertical columns, which are read from the top downward; and in each case the middle column is in honor of Thothmes, by whom the obelisks were first erected, and the side columns in honor of Rameses II., the most celebrated king of the succeeding dynasty, who reigned at least 200 years after Thothmes. On each side of the pyramidion, or small pyramidal top of the obelisk, is a bas-relief representing the sun-god, protector of the city of Heliopolis, receiving gifts from Thothmes.

CLEPSYDRA — CLERKE

Clepsydra, klĕp-sī'drā, or **Water-clock**, an instrument for the measurement of time by the escape of water from a vessel through an orifice. Its origin is extremely ancient, and has generally been attributed to the Egyptians. Two descriptions of clepsydræ have been employed — one in which the water merely escapes through the orifice, the other in which the same level is constantly maintained by the introduction of a fresh supply of water, and a uniformity of efflux secured by retaining throughout an equal amount of pressure on the fluid as it issues from the bottom of the vessel. In one kind of water-clock the measure of time is registered on a dial-plate by means of a hydraulic apparatus acted on by the efflux of water from a cistern. These instruments are now scarcely ever constructed.

Clerc, Laurent, lō-rōñ klār, French deaf mute: b. La Balme, Isère, France, 26 Dec. 1785; d. Hartford, Conn., 18 July 1869. At the age of 12 years his uncle took him to Paris, and placed him in the institution for the deaf and dumb. The abbé Sicard, though nominally its director, was then in prison for his alleged hostility to the republic; but Jean Massieu, himself a deaf mute, became his teacher till the release of Sicard, when he became a favorite pupil of the abbé. His intellectual condition, like that of most of the uninstructed deaf mutes, was at this time deplorable. "I had," he says, "a mind, but it did not think; I had a heart, but it did not feel. My mother had endeavored to show me the heavens, and make me know God, but her attempts were vain; I could comprehend nothing. I believed that God was a tall, big, and strong man, and that Jesus Christ, having come to kill us, had been killed by us, and placed on a cross as one of our triumphs." Under the skilful instruction of the abbé Sicard, he made rapid proficiency, and in 1805, after passing eight years in the institution, he was appointed tutor, and in 1806 a salaried teacher. His aptitude for teaching was such that in a few years the abbé confided to his charge the highest class in the institution. In 1815 while on a visit to England, Clerc formed the acquaintance of Gallaudet, who had gone thither in the hope of obtaining such instruction as would enable him to teach the deaf and dumb in this country. Failing in this, he subsequently visited France, and received instruction in the language of signs from the abbé Sicard and Clerc, and after spending some months under their tuition, persuaded the latter to accompany him to this country, here to lay the foundation of deaf mute instruction. Several months were spent by them in visiting the principal cities of the northern States, and soliciting aid for the establishment of the institution, since known as the American asylum for the deaf and dumb, at Hartford. On 15 April 1817 the asylum was opened with seven pupils, and Messrs. Gallaudet and Clerc installed as teachers. Much of the early success of the asylum is due to his patient and assiduous labors, and the greater part of the teachers sent to other institutions for the deaf and dumb, from this mother asylum received their training at his hands.

Clerc, Sébastien le, French designer and engraver: b. Metz, Lorraine, 1637; d. 1714. He acquired the elements of design from his father,

a goldsmith, and by the advice of Le Brun devoted himself to engraving, in which he became so distinguished that at the suggestion of Colbert he was appointed engraver in ordinary to Louis XIV. Pope Clement XI. also conferred upon him the honor of knighthood. He formed his style on that of Le Brun, improving it, however, by a careful study of Raphael; and in his published works, which number between 3,000 and 4,000, and embrace every variety of subject he has exhibited a singularly correct and elegant execution. He also published treatises on geometry, architecture, and perspective.

Clerestory, klēr'stō-rī, or **Clearstory**, the upper part of the nave in churches, above the triforium where a triforium is present, and formed by walls supported on the arches of the nave, and rising above the roof of the side aisles. In these walls windows are inserted for the purpose of increasing the light in the nave. In Norman architecture the three stories of pier arcade, triforium, and clerestory are of nearly equal height, but in Gothic the clerestory becomes relatively of greater significance and in late Gothic work is often very lofty.

Clergy, in the Christian Church, that portion of the faithful which is set apart for the ministry of religion. In the Roman Catholic Church there are eight grades or distinctions of clergy, namely, that of the simple cleric, those of the four minor orders and those of the three sacred orders of subdeacon, deacon and priest. The last three are regarded as being of divine institution. The simple cleric is one who has received the ecclesiastical tonsure; by that rite he is made a clerk or cleric, and as such is entitled to certain rights, privileges and immunities, and assumes certain obligations not incumbent on the laity. See HOLY ORDERS.

Clerk, John, Scottish naval tactician: b. Elden, near Edinburgh, 1728; d. 10 May 1812. For him is claimed the invention of the manœuvre "of breaking the enemy's line," put forth in an essay on 'Naval Tactics,' published in 1790, afterward employed with signal effect by Howe, St. Vincent, Duncan, and Nelson.

Clerk-Maxwell, James, Scottish physicist: b. Edinburgh 13 Nov. 1831; d. 5 Nov. 1879. He was a professor of natural philosophy in Marischal College, Aberdeen, in 1856-60; of physics and astronomy in King's College, London, in 1860-5; and of experimental physics in the University of Cambridge in 1871. Among his most important works are 'Essay on the Stability of Motion of Saturn's Rings'; 'Theory of Heat'; 'Electricity and Magnetism'; and 'Matter and Motion.'

Clerk, one who has charge of an office or department, subject to a higher authority as a board, corporation, etc.; a secretary, as, the clerk of the House of Representatives or Senate, clerks of the various courts, etc. In England a parish officer, a layman, whose business used to be to lead the responses in the church services and to perform other duties connected with the parish; a parish clerk

Clerke, Agnes Mary, English astronomer: b. Ireland 10 Feb. 1842. She began contributing to the Edinburgh 'Review' in 1877, and in 1888 made astronomical observations at the



CLEOPATRA'S NEEDLE, CENTRAL PARK, NEW YORK

CLERKE — CLEVEDON

Royal Observatory, Cape of Good Hope. She has published 'A Popular History of Astronomy During the 19th Century' (1885); 'The System of the Stars' (1890); 'Familiar Studies in Homer' (1892); 'The Herschels and Modern Astronomy' (1895); 'Astronomy' (1898); 'Problems in Astrophysics' (1902). In 1893 she received the Actonian prize of 100 guineas for her writings on astronomy.

Clerke, Ellen Mary, English writer: b. Ireland. She is a sister of Agnes Mary Clerke (q.v.) and has contributed extensively to English and Italian periodicals. She has published 'The Flying Dutchman,' a book of verse; 'Jupiter and His System'; 'The Planet Venus'; 'Flowers of Fire' (1902).

Clerkenwell, England, a parish of London inhabited by the better class of workingmen in the metal trades, being noted for its output of watches, optical instruments, and articles of gold and silver. The name comes from the well around which the parish clerks of London used to meet. The attempt of the Irish agitators to destroy the Clerkenwell prison was made on 13 Dec. 1867.

Clermont, The, the name given by Robert Fulton to the steamboat in which he made his first trip from New York to Albany, 11 Aug. 1807. The speed attained was only five miles per hour.

Clermont - Ferrand, klär - môn - fěr - rän, France, a town in the department of Puy-de-Dôme, of which it is the capital. It is situated on a hill at the foot of the volcanic range in which the summit of the Puy is conspicuous. It was originally the capital of the Arverni, possessed considerable importance under the Romans, and became a bishop's see in 250. It was afterward sacked by the northern hordes, but soon recovered, and was selected in 1095 for the meeting of the great council in which the crusades originated. In 1556 it became the capital of the duchy of Auvergne. Among its natives are Gregory of Tours, Pascal, and General Dessaix. The most remarkable edifices are the Gothic cathedral, a huge, irregular, gloomy pile, begun in 1248, and recently completed by the construction of the west front and two towers; the Church of Notre Dame, founded in 580, and incrustated externally with rude mosaics; the townhouse, courthouse, theatre, general hospital, etc. There are also a medical and a theological college, technical schools, observatory, public library, botanic garden, and museums of natural history and antiques. The manufactures consist chiefly of chemicals, animal oils, table-linen, nails, hats, machinery, etc. It is an important centre of trade. Near it there are two mineral springs. Pop. 40,000.

Clermont-Tonnerre, tō-nār, the name of a distinguished ancient family of counts in Dauphiny. One of the most celebrated is Count Stanislas: b. 1757; d. 1792. At the breaking out of the Revolution in 1789 he took his place in the States-General as deputy of the nobility. He maintained the doctrine of a constitutional monarchy, and incurred the displeasure of both the aristocratic and republican parties. As a counterpoise to the influence of the Jacobins, he, in concert with Malouet and other friends of monarchy, founded the Monarchical Club; and along with Fontanes started the *Journal*

des Impartiaux. The club having been denounced by Barnave as a band of conspirators, was dissolved, and the journal was suppressed after an existence of only two months. In 1791 he was arrested on the charge of having aided the king in his attempt to escape, but regained his liberty on taking an oath of fidelity to the National Assembly. The next year he was dragged by a mob before the section. As no sufficient ground of detention appeared, he was dismissed, but was pursued and murdered.

Cléry, Jean Baptiste, zhõn bāp-těst klā-rē, a French royal attendant: b. near Versailles 11 May 1759; d. near Vienna 27 May 1809. When in 1792 the royal family of France were imprisoned in the Temple, Cléry was one of the few servants permitted to accompany them. Louis XVI., a few days before his death, divided a loaf of bread with this faithful companion of his misfortune, the only proof of his regard which he was able to show him. After the king's death, Cléry was devoted to the dauphin. He wrote a journal of what passed in the Temple from the captivity of Louis XVI. until the death of the dauphin; it has been several times republished.

Clésinger, Jean Baptiste Auguste, zhõn bāp-těst ô-güst klā-zän-zhā, French sculptor: b. Besançon 22 Oct. 1814; d. Paris 7 Jan. 1883. He obtained considerable reputation for busts of distinguished persons, and also executed statues and historical groups. His colossal bust of 'Liberty,' and his statues of 'Fraternity,' 'Woman Bitten by a Serpent,' 'The Gipsy Girl,' and of Rachael and Cruvelli in some of their principal parts, are among his best known works. He was commissioned by the French government to execute an equestrian statue of Francis I. He married a daughter of Madame Dudevant (George Sand).

Clesse, Antoine, än-twän klēs'ë, Belgian popular poet: b. The Hague 1816; d. 1889. To the day of his death he followed his trade of armorer. His first ballad, 'Godfrey de Bouillon,' won for him a gold medal. His popular songs 'Beer' and 'The Family Name' (meaning Belgian, including Fleming, Walloon, etc.), came into great favor with the people. He wrote also a comedy, 'A Poet.' Two volumes of 'Songs' (1866-88) contain all his popular ballads, with the music.

Clethra, klēth'ra, the typical genus of the natural order *Clethraceæ*, or white-alder family. The family has but this single genus, which numbers about 30 species, indigenous to Japan, Mexico, South America, and the eastern seaboard of North America. The United States species are the sweet-pepperbush or white-alder *C. alnifolia*, found near the coast from Florida to Maine, and the mountain sweet-pepperbush (*C. acuminata*), a shrub or small tree growing in the mountain woods of Virginia, the Carolinas, and Georgia.

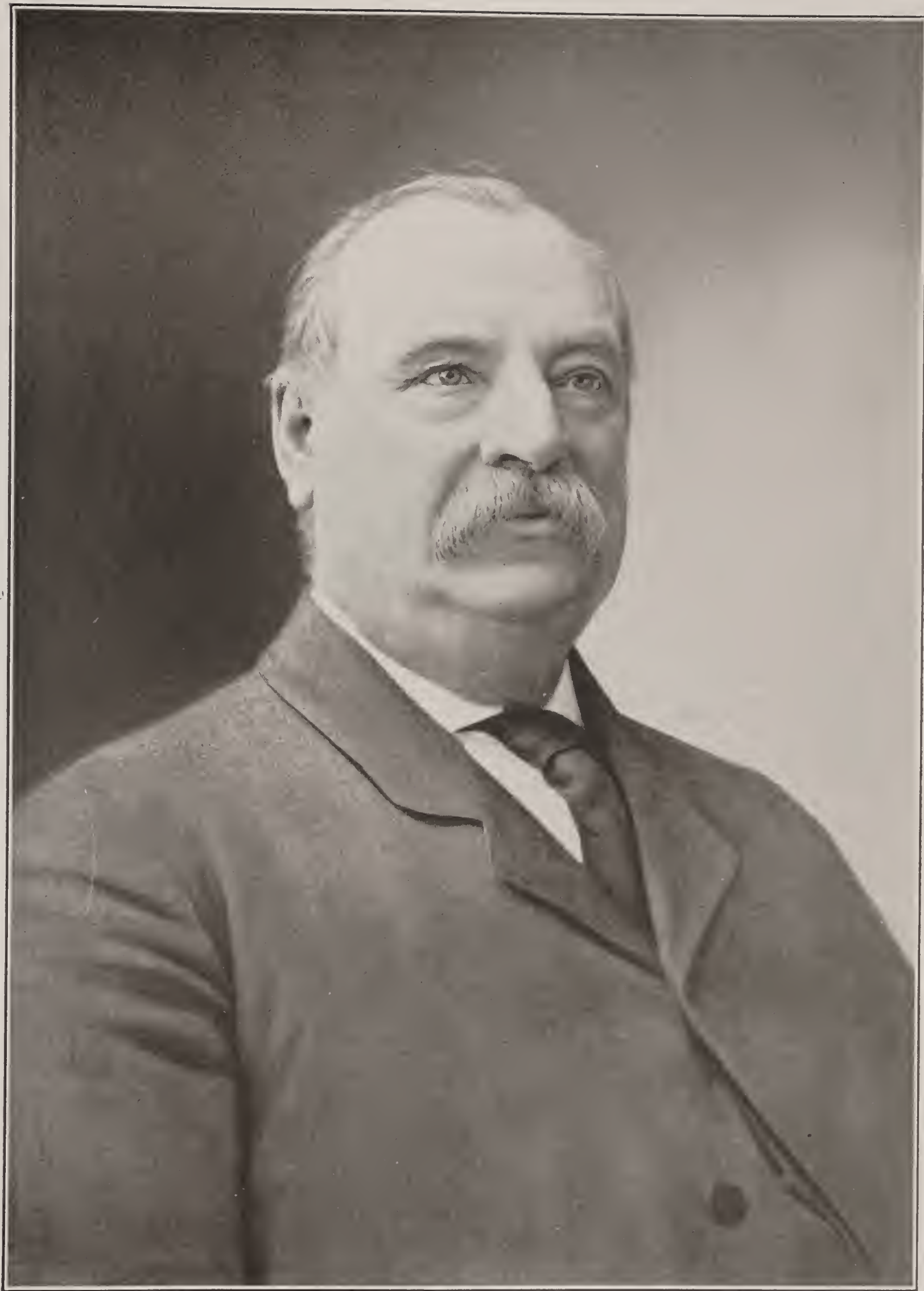
Clevedon, England, a watering-place on the Bristol Channel, about 15 miles southwest of Bristol. It is the burial-place of Hallam, the historian, and of his son Arthur, whom Tennyson's 'In Memoriam' made famous. Here Coleridge lived in 1795. Clevedon Court is the Castlewood of Thackeray's 'Henry Esmond.' Pop. (1901) 5,898.

CLEVELAND

Cleveland, Chauncey F., American lawyer and politician: b. Hampton, Conn., Feb. 16, 1799; d. there June 6, 1887. He was admitted to the bar in 1819, became active in local politics as a Democrat, and in 1826 was elected to the State legislature, where he served four consecutive terms. He was subsequently re-elected several times, serving twelve terms in all; and was speaker of the lower house in 1836, 1838, and 1863. He was appointed attorney-general of Connecticut in 1832; and was elected governor in 1842 and 1843; in both years the popular vote was indecisive and he was chosen by the legislature. In 1849 and 1851 he was elected to Congress. He was one of the leaders in the organization of the Republican party; in 1860 was a presidential elector; and in 1861 was a delegate to the Peace Congress.

Cleveland, Grover, twenty-second President of the United States: b. Caldwell, N. J., 18 March 1837. Grover Cleveland was the fifth of nine children born to Rev. Richard F. Cleveland, a graduate of Yale (1824) and Presbyterian clergyman, and Ann Neal, the daughter of a Baltimore merchant of Irish descent. He received a common school and academic education at Fayetteville and Clinton, N. Y., the successive residences of the family after leaving Caldwell, and was preparing for college when his father's sudden death (1853) changed his prospects entirely. To support himself and to aid in providing for the rest of the family he secured a clerical position in the New York Institution for the Blind, where his older brother William was a teacher. In 1855 he started west, but on his way stopped at Buffalo to visit an uncle, Lewis F. Allen, a stock breeder and publisher of 'The Herd-Book of American Short-Horn Cattle.' His uncle advised him to stay in Buffalo, and employed him in the preparation of the 'Herd-Book,' until a position as clerk and copyist was secured in a law office, August 1855. He at once set to work with perseverance and industry to make himself useful and master the rudiments of the law, with the result that in 1859 he was made managing clerk of the firm at a salary of \$600 (increased to \$1,000 in 1863), and admitted to the bar. During the war, his two brothers being in the Union army, the support of his mother and sisters fell upon him. Unable to enlist, he borrowed money to pay for a substitute. In 1863 he was appointed assistant district attorney of Erie County, serving with zeal and energy. He attended every one of the 12 grand juries which met during each of the three years of his term, and presented in full a majority of the cases. As the Democratic candidate for district attorney in 1865 he was defeated by his friend Lyman K. Bass. In 1869 he became a member of the law firm of Lanning, Cleveland and Folsom. Elected sheriff of Erie County (1870), he performed his duties faithfully and used his leisure in prosecuting further professional studies. At the end of his term, (1873) he joined the firm of Bass, Cleveland, and Bissell, acquired increasing success in practice, and took a higher position at the bar than ever before. In 1881 the citizens of Buffalo determined to check the flagrant corruption in the city government. Cleveland was elected mayor on the Democratic ticket by a majority

of 3,500, though the Republican state ticket received an average majority there of 1,600. As mayor, he displayed a thorough knowledge of the laws, a clear perception of the needs and rights of the city, and how to secure them. He insisted upon placing public interests above party claims; saved the city over \$1,000,000 by preventing corrupt schemes and bargains; and won the gratitude of people and press irrespective of party. On 22 Sept. 1882 he was nominated for governor against the Republican candidate, Charles J. Folger, and elected by the unprecedented majority of over 192,000 votes. As governor, he conducted a thoroughly business-like administration, making frequent use of his veto power, but his vetoes were always clearly sustained by his duty under the law. His record as mayor and governor won for him the Democratic nomination for president, 10 July 1884. The ensuing campaign was unusually bitter, and political issues were lost sight of in the disgraceful attacks made upon the character and personality of the two leading candidates. At the election Cleveland received 219 electoral votes to 182 cast for his Republican opponent, James G. Blaine, and was inaugurated president 4 March 1885, having resigned his governorship on 6 January. Only the briefest mention can indicate the important and difficult questions that crowded his administrations. His first message recommended a reduction of the tariff, the extension of civil service reform, regulation of the Presidential succession, and the settlement of the fisheries dispute with Great Britain. His removals from non-political offices were less sweeping than those of any president since Jackson; of 987 bills passed by Congress up to 5 Aug. 1886 he vetoed 102, chiefly private pension bills; he won a sharp contest with the Senate over suspensions and nominations; and devoted his 1887 message entirely to the existing tariff, denouncing it as vicious and unnecessary and demanding the abolition of duties on raw materials. Defeated for re-election in 1888, he retired to the practice of law in New York city (1889-93). Re-elected in 1892, he took office in 1893 in the midst of threatening currency and financial conditions. His inaugural declared that "so far as the executive branch of the government can intervene, none of the powers with which it is invested will be withheld when their exercise is deemed necessary to maintain our national credit or avert financial disaster." Accordingly he forced the repeal of the Sherman Silver Purchase Act, killed the bill for coining the seignorage, maintained the treasury's gold reserve by the successive issue of government bonds, and saved its credit throughout the world, despite furious opposition by large sections of his own and the Republican party favoring the free coinage of silver. He repudiated the Hawaiian annexation treaty made by President Harrison, enforced the neutrality laws during the troubles in Cuba, while firmly supporting American interests there, and compelled Great Britain to arbitrate her dispute with Venezuela. During the Chicago strike in 1894, he effectively asserted the executive's right to interfere in state affairs in the interest of law and order. At the close of his term he settled in Princeton, N. J., where he has since resided. He has delivered an annual series of lectures on public affairs at Princeton University, and written a



GROVER CLEVELAND,

TWENTY-SECOND AND TWENTY-FOURTH PRESIDENT OF THE UNITED STATES.

CLEVELAND

number of periodical articles on important questions with which he was required to deal while president. In 1904 he was much talked of as a candidate for a third term, but emphatically declined to be so considered.

Bibliography.—Campaign lives of Cleveland by Thos. W. Handford, Wm. Dorsheimer, Pendleton King, and Deshler Welch appeared in 1884; of these Handford's is the fullest and most authentic; 'Grover Cleveland,' by J. L. Whittle (1896), is useful. President Cleveland's messages and other public papers will be found in Richardson's 'Messages and Papers of the Presidents, 1789-1897' (Vols. 8, 9, Washington, 1898). A collection of his magazine articles has appeared in book form (1904) under the title 'Presidential Problems.'

W. N. C. CARLTON,

Librarian Trinity College, Hartford, Conn.

Cleveland, John, English poet: b. Loughborough June 1613; d. 29 April 1658. He was an adherent of the Royalist party during the civil war, and severely satirized the opposite party. He was arrested and imprisoned in 1655, but was released by Cromwell.

Cleveland, Rose Elizabeth, American prose writer: b. Fayetteville, N. Y., 1846. She is the sister of Grover Cleveland (q.v.), and after the inauguration of her brother (1885) she became the "mistress of the White House," remaining there until 1886. She published a book of essays and lectures entitled 'George Eliot's Poetry, and Other Studies' (1885); and 'The Long Run,' a novel (1886).

Cleveland, England, a hilly district in the North Riding of Yorkshire, about 28 miles long and 15 broad, between the Tees and the coast at Whitby, forming one of the parliamentary divisions of the county. It has developed enormously since the discovery of its extensive deposits of iron ore, which is smelted chiefly at Middlesbrough.

Cleveland, Ohio, "the Forest City," city and county-seat of Cuyahoga County; largest city in the State, second on the Great Lakes, and seventh in the United States; on Lake Erie at the mouth of the Cuyahoga River, 357 miles by rail east of Chicago and 183 west of Buffalo; 38 northeast of Columbus, 263 northeast of Cincinnati, 140 northwest of Pittsburg, 623 from New York against less than 500 overland, the Alleghanies forcing a long detour. For its great number of railroad and steamer connections, see *Commerce and Transportation*, below. Pop. (1900) 381,768.

Cleveland is on the edge of the great plateau of northern Ohio, sloping gradually from the lake to a ridge 115 feet above it and 689 above sea-level, rising much higher to the east. It extends about 10 miles along the lake, and a maximum of 6 miles back, with an area of some 33 square miles — its annexations of Brooklyn southwest and Newburg southeast of the Cuyahoga carrying its wings south beyond the centre. About three fourths of it, and the main business part, lies east of that river, a small crooked stream with the last few miles 200 or 300 feet wide and of some depth, lined with docks for five or six miles out of an available wharfage of 16. Its valley half a mile wide, the sunken bed of a much greater stream, is filled with car tracks and car shops, lumber,

coal, and ore sheds, ship-yards, etc., largely hidden from the city; and is spanned by two immense viaducts, uniting the east side with the west or south as the river runs. The lower viaduct connects Superior Street, the main business avenue, with Detroit Street west, making a sharp turn southwest west of the river; is of stone and iron, 3,211 feet long, 64 wide, and 68 above average water, with a 322-foot draw; and was completed 1878, at a cost of \$1,715,000 besides \$536,000 right of way. The Central Viaduct is from Ohio Street east to Jennings Avenue south, where it connects at an angle with one westward across Walworth Run, a brook running into the Cuyahoga 1½ miles above its mouth; the two have a total length of 3,931 feet (with approaches, 5,229), width 56, height 101; completed 1888, cost \$675,000. Entirely on the east side is one 834 feet long, 48 wide, and 87 high, across Kingsbury Run, a brook emptying into the Cuyahoga, a mile above Walworth on the other side. There are several other municipal and railroad bridges across the latter river.

Streets.—The focus of the city, the heart of the business quarter and the centre of the street-railway lines, is Monumental Square, about half a mile from lake and from river; and from this or near it radiate a fan of streets at every angle from northeast (parallel to the lake front) to southeast (toward Newburg). Two miles east, the long Willson Avenue runs north and south from near the lake to Broadway, the old Newburg highway; so that the older city is a rough triangle with the vertex at the square, the base Willson Avenue, one side the lake, and the other the river and Kingsbury Run. The rest of the city plan is largely haphazard: East Cleveland and old Brooklyn generally east and west by north and south, along Broadway a mass of short streets at right angles to it, the West Side based on the lake line and the river curves; but accidental or surface variations are endless. Monumental Square, originally a 10-acre park, is now divided into four sections by two broad avenues intersecting at right angles. Superior 132 feet (eight rods) wide, Ontario 99 feet (six rods). Superior runs from the river parallel with the lake front for two miles or so, then sheers off east; it is the great business street, the large stores extending along it from the square to the river and as far east. Ontario runs to the lake, as does Seneca along the west side of the square; St. Clair is parallel to Superior nearer the lake; Water Street runs from Superior near the river to the Union depot, as does Seneca to the other end. From the southeast corner of the square starts the world-famed Euclid Avenue, once said by travelers to be the most beautiful street in the world; named from the town of Euclid on the east, to which it is the highway, and as a lake road extending to Erie, Pa., 95 miles. It widens from 80 to 99 feet, and beyond the business portion is lined with splendid and costly stone mansions set from 200 to 400 feet back from the street, amid superb grounds, "estates" rather than mere dwellings. It turns east along a low ridge, but beyond Wade Park again turns northeast. Both Superior and Euclid run to the city limits; parallel to the latter on the south is the only less fine Prospect Street, extending to Willson Avenue, itself a notable residence Street, as are Case Avenue west of Willson from the lake to Kingsbury Run, East

CLEVELAND

Madison a mile east of Willson and parallel to it, and a number of shorter streets. On the South Side (Brooklyn), Jennings Avenue, reached by the Central Viaduct, is the chief residence street. The streets in general are wide, and so heavily shaded with great trees as to have given Cleveland the name of the "Forest City." The houses are nearly all detached, either tenements for the poor or flats for the richer being still comparatively few.

Municipal Conditions.—The light porous soil makes excellent drainage, and there is a good sewerage system. The death rate in 1902 was 17.1. The waterworks are owned by the city, and have cost to date above \$10,000,000, which extensions under way will largely increase; there are two pumping stations and two standpipes, the water coming from a crib 8,642 feet out in the lake, through two tunnels 90 feet below the surface, to two reservoirs on the East Side, with a daily delivery capacity of 117,000,000 gallons. A new crib and tunnel 26,000 feet into the lake, or about five miles, are under construction. Of the 600 miles of streets, toward 200 are paved, largely with Medina dressed stone, also with asphalt, vitrified brick, and macadam. The street- and suburban-railway system is very extensive: not only are there over 200 miles of track in the city, but some of the longest suburban and through lines in the country start from the square,—to Akron, 39 miles, to Painesville, 29 miles, to Elyria, 25 miles, etc. They carry package freight also. The city has four public markets. The police force in 1902 consisted of 295 patrolmen, 29 lieutenants, 16 sergeants, 12 detectives. The fire department has 28 steam-engine companies, 9 hook and ladder companies, and 3 hose companies.

Buildings, etc.—Monumental Square contains a bronze statue of the city's founder, Gen. Moses Cleaveland, and the elaborate Soldiers and Sailors' Monument to the dead of the Civil War; the marble statue of Perry, formerly here, has been removed to Wade Park. The frontage on the square is occupied by the government building, one of the two court-houses, the "Old Stone Church" (First Presbyterian), the Society for Savings, the Chamber of Commerce, a hotel, etc. The public buildings are to be replaced by a new and splendid set, grouped in a quadrangle a fourth of a mile square near the centre of the city, enclosing a park. The government has authorized its new post-office building to cost \$2,500,000, and a court-house costing at least \$3,000,000 is assured. The entire "Group Plan" improvement is estimated at \$16,000,000. The Arcade office building just east of the square, erected 1889 for \$850,000, is a prominent feature: it consists of a great interior court open to the top, surrounded by tiers of offices with balconies in front, entirely around it. The Colonial Arcade, built as a companion in 1898, is near by. The Sheriff Street market is one of the largest in the country, and the stone Union Station was such when built, and is still notable,—it is on the lake a little east of the river. Of others may be noted the Central Armory, the Caxton Building housing the Case Library, the Garfield, Hickox, New England, Perry-Payne, Cuyahoga, Lennox, Rose, and Williamson buildings; besides institutional buildings,—the beautiful one of the Cleveland Medical College, the Y. M. C. A., the House of Correction, the Northern Ohio Insane Asylum,

Adelbert College, and the Case School of Applied Science southeast of Wade Park, etc.; besides churches mentioned later.

Amusements and Clubs.—The chief places of public amusement are the Central Armory, the Grays' Armory, the Opera House, the Lyceum Theatre, the Colonial Theatre, the Empire Theatre, and the Star Theatre. The chief clubs, several owning their own club-houses, are the Colonial, Country (on the lake front east of Gordon Park), Excelsior, Roadside, University, Rowfant, Tavern, and Union.

Parks.—Cleveland has one of the finest park systems in the country, with 22 parks containing 1,326 acres, on which over \$3,000,000 has already been spent in improvements, and authority has been granted to spend another million. The most desired improvement—to make the lake front, now occupied by the Lake Shore tracks, a boulevard—is difficult of attainment; but it would complete the chief of the park plans. Four or five miles east of the Cuyahoga, Doan Brook flows into the lake, through a valley of considerable breadth. At its mouth is the beautiful Gordon Park of 122 acres, formerly a private estate bequeathed to the city. Two miles back is Wade Park of 62 acres, on an elevation overlooking the lake,—an exquisite place, with groves of magnificent trees, a boating lake, a zoological garden, etc.; and containing also the marble monument to Commodore Perry, hero of the battle of Lake Erie, removed from Monumental Square. The whole Doan Valley between and beyond them has now been purchased and presented to the city by John D. Rockefeller and others, and turned into a broad ribbon of park three or four miles long. If the lake boulevard is ultimately built, it will connect with Lakeview Park, already extending 2,500 feet along the lake front, from Erie Street to the Union Station, and the little Clinton Park, east of it, making some eight miles of continuous park drive, with Euclid avenue as the third side. Of the large number of other parks, the chief are—on the East Side, Newburg in the south, of 160 acres; Woodland Hills, southeast of Wade Park; Forest City, between Willson Avenue and the river, at the city line; Garfield Park; on the west, Edgewater of 89 acres at the lake, with a bathing and boating beach and full summer equipment; Brooklyn of 139 acres in the south; Brookside in the southwest; and small but pretty ones like "The Circle" on Franklin Avenue, with a fountain; South Side, of nine acres, on Jennings Avenue, etc.

Cemeteries.—Of the numerous cemeteries, the finest is Lakeview, at the extreme northeast of the city six miles out, off Euclid Avenue,—one of the most beautiful in the country for site and development. It is on the crest of the ridge, rising to 250 feet above the lake; on this height stands the Garfield Memorial of Ohio sandstone, 165 feet high, with a balcony around the top commanding an immense prospect of lake and land; the lower portion is a chapel containing panels and reliefs of scenes in his life, and beneath is his tomb in the crypt. Woodland of about 60 acres lies between Willson and East Madison, a mile south of Euclid; Riverside of 120 acres is in Brooklyn, southwest of the river.

Churches.—Cleveland is the seat of a Roman Catholic bishop; and in 1902 had 319 church

CLEVELAND

societies of all denominations,—including a few mission branches, and Christian Science and Spiritualist denominations. The chief were—Roman Catholic, 43, including one Italian and one Polish, besides a monastery and five convents; Methodist Episcopal, 37, including five German, one Swedish, and one Welsh; 24 Congregationalist, including two Bohemian, one Polish, one Welsh, and one colored; 22 Baptist, including three German, one Swedish, and one Welsh; 22 Protestant Episcopal, besides three parish houses; 21 German Evangelical Lutheran; 20 Presbyterian, including one Welsh; 14 German United Evangelical; 14 Hebrew synagogues; 12 Reformed Church in the United States (Bohemian Moravian); 12 Disciples; 6 Friends; 5 United Brethren; 1 Swedenborgian, etc., showing the enormous complexity of this polyglot city. The most important church edifices are the cathedral; St. Paul's and Trinity, Episcopal; First Presbyterian ("Old Stone"), Woodland Avenue Presbyterian, with the largest Sunday-school in the city; Calvary, Second and Third Presbyterian; First and Plymouth Congregational; First Methodist; and Euclid Avenue Baptist.

Charities.—Cleveland takes one of the highest places in charitable work. The most important of recent foundations is the social settlement called Goodrich House, founded in 1897, with a splendid \$80,000 building; one of the best equipped and managed in the country, with library, reading-room, parlors, and clubs, gymnasium, baths, public laundry, sewing-rooms, kindergartens, etc. Of the others, the Northern Ohio Insane Asylum, founded in 1855, has accommodations for 900 patients, with a fine building and 112 acres of ground on a slightly spot. There are 16 hospitals, with dispensaries and maternity wards, several of them having training schools for nurses; the largest is the City Infirmary and Hospital, with an average of 1,000 patients a year, and an outdoor relief department; others are the Cleveland General, Cleveland Homœopathic, Lakeside, Charity (St. Vincent's, founded 1866), St. Alexis, St. Clair, St. John, etc. There are Protestant, Roman Catholic, and Jewish orphanages, children's aid societies, homes for working women and the aged poor, an inebriate asylum, a "reformatory home for unfortunate women and girls," a Bethel home for sailors, and scores of societies for relieving every relievable distress, besides a workhouse for incorrigibles.

Educational Institutions.—The Cleveland public-school system, with 70 grammar schools, six manual-training, and one deaf-mute, one normal, and five public high schools, and about 1,300 teachers, costs about \$2,000,000 a year. It was reorganized in 1892; a director of schools and a school board of seven are elected by the people and elect a superintendent of schools who appoints the teachers. It is managed on the now well-known "Cleveland plan," in some respects an advanced step in accordance with irresistible modern drift, in others a reversion to an older type. The root idea is to abolish routine and automatic methods: there are no regular examinations and no punishments, and the teacher promotes scholars on a general judgment of capacity; while manual and domestic training are made a part of all grades. Besides these are a mass of private and parochial schools. Of secondary schools, besides the high

schools, are the University School; two for girls, the Mittleberger School and the Hathaway-Brown School; and the Ursuline Academy.

The chief seat of higher education is Western Reserve University, an institution formed by affiliating older schools and colleges and adding new; Adelbert College, till 1882 Western Reserve College at Hudson, Ohio, founded 1826; the Cleveland Medical College, with a fine museum and library, founded 1843; the College for Women, founded 1888 by the trustees of the university, as a part of it,—not an "annex," as the university confers the degrees; the School of Law, founded 1892; and the Dental College, 1893. It had in 1902, 800 students. The Case School of Applied Science, founded in 1881, and in 1887 endowed with \$2,000,000 by Leonard Case, is a highly flourishing and valuable school of technology. There are also two other law schools, that of Baldwin University (Berea, Ohio), and the Cleveland College of Law; three medical schools, the Cleveland College of Physicians and Surgeons (of Ohio Wesleyan, at Delaware, Ohio), Cleveland Homœopathic Medical College (1849), and the Cleveland School of Pharmacy; and two Roman Catholic colleges, St. Ignatius (1886), and St. Mary's Theological Seminary.

Libraries.—The chief library of Cleveland is the Public, of nearly 200,000 volumes, opened 1869; next is the Case Library (subscription), with over 50,000. The library of the Western Reserve Historical Society contains toward 25,000 volumes and pamphlets, very rich in historical value; it has also an interesting collection of historical curios. Western Reserve University has a library of 45,000 volumes. There is also a law library of some 15,000 volumes, founded 1870; and medical libraries.

Commerce and Transportation.—The violent storms of the Great Lakes made every safe harborage in the mouth of a small river a potential port of importance; and every great lake city is so located, except Detroit, on a strait off the open water. Cleveland's river gave it the first hold; but it was of little consequence till the Ohio Canal tapped the State's agriculture and made it a terminal of inter-State traffic. After railroads came, the canal gradually went out of use, and in 1879 its terminal facilities were given to the Valley R.R. (now the Baltimore & Ohio); but meanwhile the city had become of supreme importance as the nearest large lake port to the iron, coal, and petroleum of western Pennsylvania and northern Ohio (as will appear by a glance at the map), and of course as convenient for sending to them the iron and copper ore of Lake Superior. Hence it has become the greatest ore market in the world, receiving about 4,000,000 tons a year; a leading coal port, its receipts being about 6,000,000 tons a year and its shipments nearly half that; one of the chief markets for grain, lumber, and petroleum; and the greatest in the United States for fresh-water fish. Its lake traffic is enormous: 48 steamship, steamboat, and barge lines operate from here, to every port on the Great Lakes, from Duluth to Buffalo, and through the Welland Canal to Toronto and the St. Lawrence. Its clearances of vessels have been over 7,200 in one year, with a gross tonnage of nearly 9,000,000. All these lines of business have doubled since 1890. Its railroad

CLEVELAND

communications are through all the great Eastern trunk lines, and others west and south: the New York Central and its feeder the Lake Shore by Buffalo, the Pennsylvania by Pittsburgh, the Baltimore & Ohio by the Valley, the Erie through Akron, the Cleveland, Cincinnati, Chicago & St. Louis, the New York, Chicago & St. Louis (Nickel Plate), the Wheeling & Lake Erie, the Cleveland, Akron & Columbus.

The natural advantages of Cleveland have been improved by the municipality and the federal government till it forms one of the finest of harbors. The lower course of the river has been widened and deepened, and near the mouth given a uniform width of 325 feet, in place of a minimum of 150; and at each side of the mouth a stone pier 1,500 feet long has been built out into the lake, affording a channel 16 feet deep. The public dock frontage on river and lake amounts to over a mile, about half of which has been improved. A western arm of the river, about a mile long, parallel to the lake shore a little way in, has been dredged to a large ship canal, with railway docks. But still more important is the great government breakwater, begun in 1879, and \$8,000,000 already spent on it. Starting opposite the mouth of the western arm, it runs about 3,000 feet into the lake, then 4,000 feet northeast parallel to the shore till opposite the main mouth, then with a break of 500 feet runs for another 2,000 feet to opposite the Union Station, forming a sheltered basin of some 300 acres west of the mouth. An extension of the eastern arm 4,000 feet farther is now under way, making nearly two miles of outer wall.

Manufactures.—Cleveland is the second largest manufacturing place on the lakes, and second in the State; and in the manufacture of iron and steel and the goods made from them, is among the foremost in the country, owing to its proximity to Pennsylvania iron, Ohio coal, and limestone from the Lake Erie islands, and its being the place of receipt of Lake Superior iron. It is the centre of the malleable-iron trade of the country; first in the United States for wire and wire nails, and second in hardware: the first of lake ports in iron and steel shipbuilding, as formerly in wooden shipbuilding,—the actual number of vessels turned out being greater than in any other United States city, and some of them reaching 380 feet long and a cost of half a million dollars,—and forges a large part of the steel shafts and stern-posts of the vessels built on the Atlantic coast. The variety of its industries in this kind is almost endless,—as bridge castings and forgings, rails, car wheels, engines and boilers, cranes for unloading vessels, railway machinery of all sorts, printing presses and sewing machines, oil and gas stoves, etc. The five groups alone of “iron and steel,” “bolts, nuts, washers, and rivets,” “forgings,” “iron work, architectural and ornamental,” and “foundry and machine-shop products,” aggregate over \$45,000,000 a year; and electrical apparatus, over \$3,500,000 more. Besides these, there is a remarkable and most valuable variety of small specialties demanding highly skilled labor, often performed by independent workmen not compacted in shops, as optical instruments, and other scientific work of delicate accuracy. The next greatest industry is that of slaughtering and meat packing, which amounted in 1900 to \$7,514,470, second only to Cincinnati in the

State. Men’s and women’s clothing, malt liquors, petroleum refining, paints, and chemicals are also of great importance and volume. The total product of its industries in 1900 was \$139,849,806, employing 64,220 workmen and officials, with wages and salaries amounting to \$33,624,834 yearly.

Finances and Government.—The assessed value in 1900 was \$142,768,280, against \$99,614,055 in 1890; the net debt (there being a sinking fund of \$2,607,000), \$14,121,530; tax rate, \$30 per \$1,000, of which slightly over one third was for schools. The expenditures are about \$6,000,000 a year, with large special outlays for improvements, of which the great public-building scheme is chief. The government is by the new city code of 1903, which went into effect in May of that year, and differs materially from the former federal plan of separating executive from legislative powers, which for more than a decade was in force. The new plan comprehends a two-years’ mayor; an elected Board of Public Service; a Board of Public Safety, appointed by the mayor, and a council of 32 members in a single chamber, which makes all appropriations; and the chief school and court officials and the city treasurer are elected by the people.

Banks.—In 1902 there were 71 banks of all denominations operating in the city, including 14 national banks, with combined capital of about \$11,000,000, and deposits of over \$50,000,000, against \$15,000,000 in 1890. The savings banks have upward of \$100,000,000 on deposit, against \$37,000,000 in 1890.

Population.—1820, 606; 1830, 1,076; 1840, 6,071; 1850, 17,034; 1860, 43,417; 1870, 92,829; 1880, 160,146; 1890, 261,353; 1900, 381,768, of whom 124,631 were foreign-born, and 163,570 native-born of foreign parentage,—288,201 in all; and 87,740, or 23 per cent, were native Americans. An analysis of this influx, however, makes not quite so extreme a showing. Of these foreigners, 47,566 were Germans, 18,460 English of Great Britain or Canada, 13,579 Bohemians, 13,120 Irish, 9,558 Hungarians, 7,696 Poles, 3,607 Russian Jews, 3,065 Italians, 2,179 South Americans, 1,490 Welsh, 1,000 Swedes, etc. The immigration 1880–90 being roughly on the same lines, and assuming one third the Irish immigration to be from the North and therefore practically English, the people of English stock would be raised to 140,000, or toward 37 per cent in place of 23.

History.—For the claim of Connecticut to the territory from lat. 41° to 42° 1' N., and 120 miles west of the Pennsylvania line, see WESTERN RESERVE. That State conveyed its title to the Connecticut Land Company, which in 1796 sent out Moses Cleaveland to survey the land and establish “New Connecticut”; and his party, having surveyed 60 miles, ran the line north to the Cuyahoga and followed it to the lake, reaching the latter 22 July. Cleaveland at once fixed on the plateau as the capital of the new State, and had it laid out, with the square and its two main streets (not intersecting) as now, with the same names, but Euclid (then called Middle Highway) only starting from Huron Street; it was not cut through to the square till 1815. The settlement was given Cleaveland’s name, but not his chosen spelling, the first survey map bearing “Cleveland”; usage fluctuated, but was fixed in 1831

369

CLEVELAND, OHIO.



1. Lakeview Cemetery, showing Garfield monument.

2. Superior street.

CLEVELAND — CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS RY. CO.

by the adoption of the shorter form by a newspaper, it is said because the "a" would not go into a headline. The soil being poor, most immigrants went on into the interior; early commerce was on the Ohio, and for a decade Cleveland remained a hamlet with a few dozens at most, those mainly Connecticut people. It became a part of Jefferson County in 1797, of Trumbull County in 1800,—the United States having assumed administration over the Western Reserve,—and of Geauga County, its county-seat in 1805, just after it had become a port of entry; in 1810 Cuyahoga County was formed, with Cleveland for its seat, probably having about 100 inhabitants. They must have been of good quality, however, as a library was started in 1811. In 1814 Newburg was set off, and for many years was the more important of the two, from its water power. On 1 June 1815 Cleveland was incorporated as a village; and in 1816 the first bank was started. In 1818 the first newspaper was issued, the *Cleveland Gazette and Commercial Register*. In 1820 it had grown to over 600. In 1824 the first steam vessel was launched. But two great events happened to it near the end of the decade. In 1827 the Ohio Canal was opened to Akron, and in 1832 to the mouth of the Scioto at Portsmouth; and in 1828 the cutting of a channel across the bar at the river mouth, giving it 10 feet of water, was completed. These were its making, and with about 1,000 in 1830, the town had grown to over 6,000 in 1840. In 1836 with about 4,000 people it received a city charter, two days after its neighbor Brooklyn across the river had received one as "the City of Ohio," which lasted till 1853, and was then annexed to Cleveland. In 1834 a horse railroad with wooden rails was built to Newburg.

The same year five steam railroads were chartered from Cleveland to everywhere, and the Ohio R.R. to the Maumee sold a good deal of stock; but the panic of 1837 ended such speculations, and it was not till 1846 that more were even chartered, and about five years later before the first one was built. The advantage was immense, and it leaped from 17,000 to 43,000 within a few years. About the time of the war the iron industry began to take root, and the manufacture of iron products for the government during the war crowded its manufactories, as did that of clothing. Since then its history is mainly that of an enormously expanding industrial city, but one that has never forgotten to keep its intellectual growth and the spirit of culture abreast of its material development. In 1872 it annexed East Cleveland; in 1873 Newburg; in 1893 West Cleveland and Brooklyn. In 1896 it celebrated its centennial.

Cleveland began the new century with no abatement of its remarkable increase in population and with many evidences of expansion in a material way. The additions to the water-works and sewerage systems, the improvement of the lake front and the river channel, the establishment of the colossal group plan of public buildings, the increase of street paving, and the continued extensions of the park and boulevard systems, indicate that Cleveland is in the midst of an era of progressive activity with which no previous period in its history can bear any comparison.

W. R. ROSE,

Associate Editor Cleveland Plain Dealer.

Cleveland, Tenn., a city and county-seat of Bradley County, about 30 miles from Chattanooga, on the Southern R.R. In addition to the usual industries of a town in an agricultural region, it has stove-works and woolen and flour mills. It is the site of Centenary Female College. Pop. (1900) 3,858.

Cleveland, Cincinnati, Chicago & Saint Louis Railway Company, The. This road, better known as the "Big Four Route," is 2,600 miles in length. The first road completed in the State of Indiana, which is now a part of the Big Four system, was that from Madison to Indianapolis, and, although a charter for it had been granted as early as 1831, the actual work of construction was not commenced until 1836, and it was 1 Oct. 1847, before it was completed to Indianapolis.

A railroad from Indianapolis to Union City was next projected. In the winter of 1850 the road was extended to Pendleton, a distance of 28 miles, and in 1852 cars were running to Union City, 64 miles away. In 1859 it was consolidated with the Ohio Line, and, in 1868, with a line from Cleveland to Cincinnati, when it became known as the "Bee Line."

In 1853 a road was opened from Indianapolis to the Ohio River, at Lawrenceburg, and, in 1854, this line was extended to Cincinnati. In 1856 the charter was granted for a road from Indianapolis to La Fayette, and, in 1866, this road was consolidated with the Indianapolis and Cincinnati line. Connections were formed which gave the road entry in Chicago as well as into Saint Louis; new rails were laid; new equipment was purchased, and, in 1890, the "Bee Line," with all its connections, was consolidated with the Big Four, the new system assuming the latter title. Later the Wabash & Michigan and the Old Indiana, Bloomington & Western, with its two divisions, one reaching to Peoria on the west, and the other to Sandusky on the east, were incorporated in the great system.

Some idea of the full extent of the Big Four system may be gained from the following list of railroads, all of which are now incorporated in the Cleveland, Cincinnati, Chicago & Saint Louis Railway Company:

The Pendleton & Indianapolis R.R. Co. was chartered 15 Jan. 1846. This road was combined with the Indianapolis & Bellefontaine R.R. Co., before its construction was completed. The name of the latter company was changed to that of the Indianapolis, Pittsburg & Cleveland R.R. Co., in 1854. The Bellefontaine & Indiana R.R. Co. was chartered in Ohio, 25 Feb. 1848, and, in 1864, it was consolidated with the Indianapolis, Pittsburg & Cleveland Company, under the name of the Bellefontaine Railway Company. The Cleveland, Columbus & Cincinnati R.R. Co., was chartered 14 March 1836. In 1862, the company purchased the Springfield, Mount Vernon & Pittsburgh road, originally chartered in 1850 as the Springfield & Mansfield R.R. Co., and, in 1868, it consolidated with the Bellefontaine Railway Co., taking the name of the Cleveland, Columbus, Cincinnati & Indianapolis R.R. Co. In 1880 it leased the Mount Gilead Short line.

The Indianapolis & St. Louis R.R. Co., was the outcome of the efforts of the Cleveland, Columbus, Cincinnati & Indianapolis; the Pittsburg, Ft. Wayne & Chicago, and the Indian-

CLEVENGER — CLICHY-LA-GARENNE

apolis, Cincinnati & La Fayette companies to secure an independent line from Indianapolis to Saint Louis. The first meeting of the roads in consolidation was held 5 Sept. 1867. Six days later a 99-year lease was signed with the Saint Louis, Alton & Terre Haute Ry. Co., which was the closing link in the through line from Indianapolis to East Saint Louis. When the Indianapolis & Saint Louis Ry. Co. was sold by the receiver, in 1882, it was purchased by the Cleveland, Columbus, Cincinnati & Indianapolis Ry. Co., and has since been operated in its interests. With it was taken the Carbon & Otter Creek Valley R.R. Co., a line used as a feeder to the I. & St. L.

The Indianapolis & Cincinnati R.R. Co., chartered 4 Oct. 1853, was a combination of the Lawrenceburg & Indianapolis, the oldest line in Indiana; the Lawrenceburg & Rushville, afterward the Lawrenceburg & Upper Mississippi, and the Shelbyville & Indianapolis roads. These several consolidations were all effected prior to 14 Feb. 1864, when the Indianapolis & Cincinnati road was itself consolidated with the La Fayette & Indianapolis Company to make the Indianapolis, Cincinnati & La Fayette R.R. Co. In 1870 the system went into the hands of a receiver, and, in 1880, it was sold and incorporated as the Cincinnati, Indianapolis, Saint Louis & Chicago Ry. Co.

The Cleveland, Cincinnati, Chicago & Saint Louis Railway Co., the official title of the "Big Four Route," was a consolidation of the Cleveland, Columbus, Cincinnati & Indianapolis; the Cincinnati, Indianapolis, Saint Louis & Chicago, and the Indianapolis & St. Louis Railway Companies. It was effected 30 June 1889, but, prior to that time, the Cincinnati, Indianapolis, Saint Louis & Chicago Company had acquired the Vernon, Greensburg & Rushville, the Fairland, Franklin & Martinsville, and the Cincinnati, La Fayette & Chicago roads. The latter included the recently acquired Kankakee & Indiana R.R. The Hope & Greensburg had been built and had been extended to the Columbus, Hope & Greensburg.

The Mad River & Lake Erie Ry. Co., chartered 5 Jan. 1832, constructed its Findlay Branch in 1845, and acquired control of the Sandusky City & Indiana R.R. Co., in 1854. In 1858 it changed its name to the Sandusky, Dayton & Cincinnati R.R. Co. In 1865 it went into the hands of a receiver, and was reorganized, 1866, as the Sandusky & Cincinnati R.R. Co. For about two years it was operated by the Cincinnati, Dayton & Eastern R.R. Co., but when, in 1868, the lease was surrendered, the road adopted the name of the Cincinnati, Sandusky & Cleveland R.R. Co., but all the lines operated by this corporation were finally brought under the control of the Big Four. Among these was the lease of the Columbus, Springfield & Cincinnati R.R. Co.

The Cairo, Vincennes & Chicago Ry. Co. was practically a receivership consolidation of the Danville & Southwestern, the Saint Francisville & Lawrenceville, and the Vincennes & Cairo roads. In 1890 the Big Four assumed control of the lines under an operating agreement. Among the properties of the company at that time was a large and important portion of the old Saint Louis, Terre Haute & Alton R.R. Co.

The Cincinnati, Wabash & Michigan R.R. Co. was the result of a consolidation of the

Warsaw, Goshen & White Pigeon R.R. and the Grand Rapids, Wabash & Cincinnati road. It was effected in 1871. In 1882 it was consolidated with the Elkhart, Niles & Lake Michigan R.R. Co., under the name of the Cincinnati, Wabash & Michigan Railway Co., and in 1892 the entire property was purchased and incorporated in the Big Four system.

The White River Railroad Co. was taken under an operating contract in 1891, while the Cincinnati & Southern Ohio Railroad Co., formerly the Louisville, Cincinnati & Dayton, was virtually constructed under the directions of the Cleveland, Cincinnati, Chicago & Saint Louis company and became a part of that system.

The Cincinnati & Springfield Railway Co., was acquired by the Cleveland, Cincinnati, Chicago & Indianapolis Ry. Co., under a 999-year lease, sometime prior to its completion, in 1872, and so passed into the control of the Big Four Route.

For the year ending 30 June 1905, the total earnings were \$22,141,110 and other income \$284,217. The operating expenses were \$16,131,112 and the total payments were \$3,915,378, thus showing a surplus of \$2,378,837.

H. J. RHEIN,
General Passenger Agent.

Clevenger, klěv'ěn-jěr, **Shobal Vail**, American physician: b. Florence, Italy, 24 March 1843. He was the son of an American sculptor of the same name. During the Civil War he was a first lieutenant in the engineer corps, and later United States deputy surveyor in Montana and Dakota, writing a 'Treatise on Government Surveying' (1847). He graduated at Chicago Medical College, 1879, established himself in practice in that city, and is a specialist in nervous and mental diseases, and a professor and lecturer in several colleges. He has written: 'Comparative Physiology and Psychology' (1884); 'Artistic Anatomy' (1885); 'Spinal Concussions' (1889); 'Medical Jurisprudence of Insanity, or Forensic Psychiatry' (2 vols. 1898), and many professional articles in scientific and medical journals.

Clèves, klāv (German *Kleve*), Prussia, chief town of the Rhine province, 70 miles northwest of Cologne, and 4½ miles from the Rhine, with which it is connected by a canal. It has manufactures of machinery, tobacco, leather, and cotton. In the centre of the town rises the old and renowned Schwanenburg (Swan's Castle), the ancient residence of the dukes of Clèves, founded, according to tradition, by Julius Cæsar. The collegiate church, dating from the 14th century, contains monuments of the counts and dukes of Clèves. Prussia (Brandenburg) acquired Clèves in 1609. Pop. 15,000.

Cliche, klěsh, an electrotype or stereotype cast from an engraving.

Clichy-la-Garenne, klē-shē-lä-gä-rěn, France, (Latin, *Cligiacum*), a town in the department of the Seine, near the right bank of the Seine, and on the railway between Paris and St. Germain, about four miles northwest of Paris. In the 7th century it was frequently the residence of the court. It contains a parish church, the erection of which is due to the celebrated Vincent de Paul, who was curate of Clichy in 1612; and has manufactures of white-lead, chemical products, glue, varnish, rolled lead, etc. Pop. (1901) 39,521.

CLIENTS — CLIFFORD

Clients, citizens of the lower ranks in ancient Rome who chose a patron from the higher classes, whose duty it was to assist them in legal cases, and to take a paternal care of them. The clients, on the other hand, were obliged to portion the daughters of the patron if he had not sufficient fortune, to follow him to the wars, to ransom him if taken prisoner, and to vote for him if he was candidate for an office. If a client died without issue, and had made no will, his property fell to the patron. Clients and patrons were under mutual obligation not to accuse each other, not to bear witness against each other, and in general not to do one another injury. This relation continued till the time of the emperors. It may be considered as the transition from a patriarchal state, in which family relations are predominant, to a well-developed political system, securing the rights and independence of the individual. In modern times the word client is used for a party to a lawsuit who has put his cause into the hands of a lawyer.

Cliff. Nearly vertical rock walls are formed in a variety of ways by natural means. In the development of a drainage system in any high-lying tract of country, ravines, gorges, and cañons are formed by the down-cutting streams, as Watkins Glen, N. Y.; the gorge of the Niagara River, and the Grand Cañon of the Colorado. After long erosion the softer rocks may be removed, leaving the harder with steep faces standing above the surrounding country, as at the Delaware Water Gap, in the Catskills, and many places in the Appalachian Mountains. In high mountains glaciers dig out deep channels. Cliffs formed in these ways may be called cliffs of erosion. Where a high coast borders any large body of water, the waves eating into the land form cliffs, as on the northern shores of Scotland, southern England, the coast of Maine, and elsewhere. Such cliffs may be called sea cliffs. Cliffs may also be formed by the rock fractures known as "faults," where the rocks on one side of a fracture rise faster than they are worn down by weathering. Such cliffs are not uncommon; they are found in many parts of the West, being especially prominent in arid regions like the Colorado plateau, where weathering is slow. Such cliffs may be called "fault cliffs."

Cliff Dwellers, a race of Indians formerly living in the cliffs bordering on the valleys of the Rio Grande and Rio Colorado. Their homes were built in the recesses of these cliffs at a height often of several hundred feet from the ground, and at the present time seemingly inaccessible, as the former paths that led to them have nearly all been destroyed by the crumbling away of the rocks. These dwellings sometimes consisted of many rooms, and in some cases were two or more stories high, hewn in the rock, with wooden lintels in the doors and windows, which were probably closed with skins or blankets. The walls were finished with a plaster of clay. How the inhabitants subsisted is not known, but probably mainly by hunting and fishing, as the soil about these localities is barren. The Pueblo Indians, who are still to be found in that section, are probably descendants of the Cliff Dwellers, and possess considerable skill in making articles of pottery, etc.

Cliff-Dwellers, The, a novel by Henry B. Fuller (1893). It is a story of contemporary Chicago; a sober arraignment of the sin and greed of a purely material civilization. The protagonists of the drama take their title of "cliff-dwellers" from their occupation of various strata of an enormous office building. The story is too sincere to be called a satire, and too artistic to be called a photograph; but it is executed with a merciless faithfulness that has often elicited both characterizations.

Cliff Haven. See SUMMER SCHOOLS.

Cliff Swallow, a species of swallow (q.v.), the *Petrochelidon lunifrons* of ornithologists. The sexes are alike, of a lustrous steel-blue color above, with a brownish white crescent on the forehead, the under parts generally grayish with a blue patch on the breast, and the throat, chin, and sides of head rust color. From most other species of the *Hirundinidæ* (q.v.) the cliff swallow is distinguished by the very short square tail, beyond which the tips of the folded primary wing feathers extend, and the thick bill. The cliff swallows inhabit North America, except Florida, to the northern limit of the tree zone, and breed in colonies nearly throughout their range; in winter they enter South America. Probably on account of their social habits, cliff swallows are distributed very irregularly, in some places being very common, in others rare. Formerly this species attached its remarkable retort-shaped nests of mud to cliffs, which have now been generally forsaken for the more convenient and accessible eaves of barns, etc.; on this account it is known in some localities as eave swallow, in others, from the material used in constructing the nests, as mud swallow.

Cliff'ord, the name of a very old English family, several members of which have played an important part in history. The founder of the family, Walter, son of Richard Fitz-Ponce, a Norman baron, acquired the castle of Clifford, in Herefordshire, under Henry II., and hence took the name of Clifford. In 1523 the Cliffords became earls of Cumberland, but in 1643 this title became extinct. The male line of the Cliffords is at present represented by the baronial family Clifford of Chudleigh. The first Baron Clifford of Chudleigh was Thomas Clifford, one of the members of the Cabal, who was raised to this dignity in 1672.

Clifford, George, Earl of Cumberland: b. 1558; d. 1605. A celebrated English navigator.

Clifford, Hugh, English civil servant: b. London 5 March 1866. He entered the Malay states civil service in 1883 and was British resident at Pahang 1896-9. He has published: 'In Court and Kampong' (1897); 'Studies in Brown Humanity' (1898); 'Since the Beginning' (1898); 'In a Corner of Asia' (1899); 'Bushwhacking' (1901); and is joint author with F. Swettenham of a 'Dictionary of the Malay Language.'

Clifford, John, English Baptist clergyman: b. Sawley, Yorkshire, 16 Oct. 1836. He was educated at the Baptist College, Nottingham, University College, London, and the Royal School of Mines and has been minister of the Praed Street and Westbourne Park Church, London, from 1858. He was president of the London Baptist Association, 1879; of the Baptist Union, 1888 and 1889; of the British Chau-

CLIFFORD — CLIMATE

tauqua, 1899-1900, as well as of other assemblies. He has received degrees from several English colleges as well as of D.D. from Bates College, Lewiston, Maine, and has been for years the acknowledged leader of the Baptist faith in England. He was editor of the 'Baptist Magazine,' 1870-83 and has published 'Familiar Talks with the Young' (1872); 'George Mostyn' (1874); 'Is Life Worth Living' (1880); 'Daily Strength for Daily Living' (1885); 'The Dawn of Manhood' (1886); 'The Inspiration and Authority of the Bible' (1892); 'The Christian Certainties' (1893); 'Typical Christian Leaders' (1898); 'Social Worship an Everlasting Necessity'; 'God's Greater Britain' (1899).

Clifford, Lucy Lane, English novelist, married to William Kingdon Clifford (q.v.) 1875; after whose death in 1879 she turned to literature for support. Her writings, some of which are notably original and striking, include: 'Very Short Stories' (1882); 'Mrs. Keith's Crime' (1885); 'Love Letters of a Worldly Woman,' which attracted much attention (1891); 'The Last Touches' (1893); 'Aunt Anne' (1893); 'A Flash of Summer' (1895); 'Mere Stories' (1896); 'A Woman Alone' (1901); 'Woodside Farm' (1902); and the plays, 'The Likeness of the Night' (1900); 'A Long Duel' (1901); 'A Supreme Moment' (1902); 'Margaret Vincent.'

Clifford, Mrs. W. K. See CLIFFORD, LUCY LANE.

Clifford, Nathan, American jurist: b. Rumney, N. H., 18 Aug. 1803; d. Cornish, Me., 25 July 1881. Through his own efforts he obtained a common school and academic education, studied law, and began practice in York County, Me., 1827. He was a member of the State legislature, 1830-4; speaker of the House, 1833, and attorney-general of the State, 1834-8. He served two terms as representative in Congress 1839-43, advocated Van Buren's re-election, took part in public discussions with the leading Whig orators, and established a reputation as one of the most eloquent of democratic champions. He was United States attorney-general under President Polk, and a special commissioner to Mexico to arrange terms of peace between that country and the United States, and he negotiated the treaty which secured California as a part of the United States. He resumed law practice in Portland, Me., 1849, and won an enviable reputation for forensic ability. In January, 1858, President Buchanan appointed him associate justice of the United States supreme court. As the oldest associate judge in 1877, he presided over the electoral commission conducting its proceedings with noteworthy impartiality, though a firm believer in Tilden's election.

Clifford, William Kingdon, English mathematician: b. Exeter 4 May 1845; d. Madeira 3 March 1879. Educated in his native town and at King's College, London, he proceeded to Trinity College, Cambridge, where he graduated in 1867 as second wrangler. In 1871 he was appointed professor of applied mathematics at University College, London, a post which he held till his death. In 1876 his health gave way, but was restored by a summer spent in Spain and Algiers, though not permanently, for two years later he again broke down, and died

soon afterward. In mathematics his teachings and writings are regarded as marking an epoch in the history of the science in England. His 'Canonical Dissection of a Riemann's Surface,' his theory of 'Biquaternions,' and his memoir 'On the Classification of Loci,' may be mentioned as his most important contributions to this subject. He also wrote on philosophical subjects. Among his works the most important are: 'Elements of Dynamic' (vol. i. on 'Kinematic,' 1878); 'Seeing and Thinking' (1879); and 'Common Sense of the Exact Sciences' (1885, completed by Karl Pearson). In 1882 appeared a collection of his 'Mathematical Papers,' and in 1879 his 'Lectures and Essays.'

Clif'ton, England, a popular watering-place of Gloucester County. It is a suburb of Bristol situated within the city boundary, on the summit of lofty cliffs, whence its name. A suspension bridge 703 feet long here crosses the river Avon 245 feet above its bed. Clifton contains many handsome residences but neither trade nor manufactures. It is known for its hot mineral springs. Clifton College is an important educational institution. Pop. 44,400.

Clifton Springs, N. Y., a summer and health resort in Ontario County on the New York Central and Lehigh V. R.R.'s, famous for its sulphur springs. Pop. (1900) 1,617.

Climacteric (*annus climactericus*), a critical year or period in human life wherein, according to astrologers, there is some notable alteration to happen in the body, and a person is exposed to great danger of death. The word comes from *κλιμακτής*, the step of a ladder or stair. The first climacteric is, according to some, the seventh year; the others are multiples of the first, as 14, 21, etc.; 63 and 84 are called the grand climacterics, and the dangers attending these periods are supposed to be great. Some held, according to this doctrine, every seventh year a climacteric; others allowed this title only to the product of the multiplication of the climacterical space by an odd number, as 3, 5, 7, 9; others considered every ninth year as a climateric. The idea of climacterics is very ancient.

A climateric disease is a disease affecting both men and women, but more obvious in the former. It may be looked for about the 63d year of age, but varies in the time of its coming, according to the constitution of the individual, the limits being in the one direction 50, and in the other 75. Its most common predisposing cause is mental anxiety or suffering. The expression of the countenance alters for the worse, the pulse becomes accelerated, the flesh wastes away without obvious cause; there are sleepless nights, and wandering pains flit through the head and chest, and sleep is either deficient or brings little refreshment. After a time recovery as a rule takes place, but the countenance never recovers its former aspect, or the constitution its vigor.

Climate (Gr. *κλίμα*, "a slope or inclination"). The term was used to denote the effect of the oblique rays of the sun on the temperature of the earth and its atmosphere. To-day it is applied to the sum of the atmospheric conditions as recorded for a long period of time; or, in other words, it is the totality of weather, while "weather" is the physical con-

CLIMATE

dition of the atmosphere at a given time or during a limited period.

One may well speak of the weather to-day, or of last month, or of some past year; but not of the climate of a day, a month, or a year. The climate of a place is what may be expected to occur as the result of a study of its continuous weather records for a long period of years,—the atmospheric pressure, the temperature, the rainfall and snowfall, the time and frequency of frost, the extremes of heat and cold, the direction and velocity of the wind, the amount of air that flows from the different points of the compass, the amount and intensity of sunshine, the humidity and transparency of the atmosphere, and its electrification.

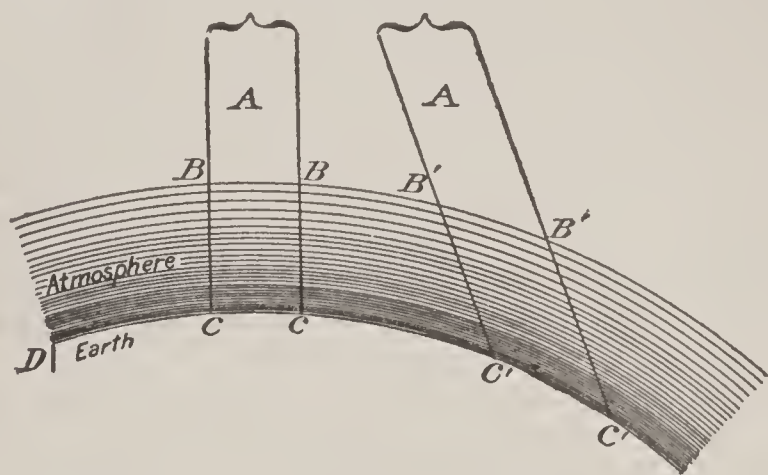
The study of the causes of the weather and of the laws of storms constitutes that branch of science known as meteorology; climatology is to be considered as a subdivision of meteorology.

Climates may be broadly divided into marine, continental, mountain, and plain, with the many variations produced as these conditions gradually or precipitately shade off the one into the other.

Basis of Climate.—If the axis of the earth's rotation were perpendicular to the ecliptic (the plane of its orbit) there would be no seasonal changes, for the rays of the sun would fall upon every point on a parallel of latitude with the same angle of incidence on each day of the year. There would be but one season at any place and it would never end; and there would be little variation in the intensity of storms. But as the axis of the earth is inclined at an angle of 23.5° to the plane of its orbit, and as the direction toward which it points remains nearly constant, there are but two days in each year when both hemispheres (north and south) are exactly one half in sunshine and one half in darkness, that is, at the vernal and autumnal equinoxes, when the sun crosses the equator. At all other times in each hemisphere the angle at which the sun's rays strike the earth, the depth of the air through which they pass, the length of the day, and the proportions of each hemisphere immersed in sunlight, are increasing or decreasing. As these four conditions increase in the northern hemisphere after the vernal equinox the summer grows upon us, reaching its greatest degree of heat about four weeks after the summer solstice. The lag of temperature is due to the fact that the atmosphere, being heated mainly by radiation from the earth and comparatively little by the direct action of the solar rays, does not attain its greatest heat until after the land and water have reached their maximum temperature and in turn have communicated this heat to the air above. Up to June 21, or the summer solstice, the northern hemisphere receives each day more heat than it loses, otherwise it could not gain in temperature; after the solstice the sun each day at meridian is found to have receded a little to the south. At places north of the tropic of Cancer its rays fall with increasing obliquity and pass through a greater depth of air, and impinge for a less time each day, so that within a few weeks the earth begins to radiate more heat each day than it receives. The maximum heat of summer occurs, on the average, when the loss of heat from the earth is just equal to that gained during the day from

the sun. This, as previously stated, occurs several weeks after the sun is well on its way southward. About September 21 the autumnal equinox occurs, when the sun crosses the equator, and, as at March 21, the days are of equal length at all latitudes of both hemispheres. On or about December 21—the winter solstice—the sun is farthest south, and the same conditions prevail in the southern hemisphere that prevailed in the northern hemisphere on June 21. North of the equator the sun is now least effective; its rays reach the earth at the lowest angle through the greatest depth of air, and they are operative for the fewest hours during each day, of any portion of the year, but the greatest cold does not occur. This comes about four weeks later, when the increasing heat received each day by the earth from the sun is just equal to that lost by radiation.

The effect of latitude will be understood by reference to the following figure:



As the latitude increases, the rays of the sun will fall with increasing obliquity, and they lose in power by being spread over a larger surface, and by traversing a greater depth of air, which absorbs more of their heat.

The same beam A, "when the sun is vertical, is spread over a surface such as CC. When the sun is inclined at an angle as shown in the figure, the beam is spread over a surface, C' C', which is somewhat greater than the first, and it passes through a column of air, B' B' C' C', greater than that of BBCC. The intensity of insolation at midday decreases approximately as the cosine of the latitude."

Near the equator the sun's rays at midday fall perpendicular to the surface of the earth, and there is virtually no change in the length of the day, and consequently there is little variation in the daily or seasonal temperature. As the variation in the length of the day increases with the latitude, there are regions, in the temperate zone, where the length of time that the sun's rays fall upon the earth each day more than compensates for their obliquity. On this account the interior of continents may have at midday a higher temperature than prevails at the equator.

Solar energy is about seven per cent greater at perihelion (the point in the earth's orbit nearest the sun) than at aphelion (the point farthest away). As perihelion occurs in December, or the summer time of the southern hemisphere, and aphelion in its winter, that region has a greater annual range in the intensity of solar insolation than the northern hemisphere. If the land surfaces of the two hemispheres were equal in area, the southern would have colder winters and warmer sum-

CLIMATE

mers than the northern, and this is the case in portions of the southern hemisphere where the land area is large. But the great capacity of water for heat, and the slowness with which it radiates the same, modifies seasonal extremes that otherwise would be much greater.

Variations in Climates.—If the earth were all water or all land, and if the land were everywhere of the same elevation, most of the factors that cause variations in climates—often considerable for regions closely contiguous—would be eliminated from the equation. Every point on the same parallel of latitude would have the same mean annual temperature, and the same average heat in summer and the same average cold in winter. New York and London, separated by eleven degrees of latitude, would not, as now, have about the same mean annual temperature. If it were all water, there would be no such extremes of heat and cold as we now know. It is probable that a thermometer exposed in shade four feet from the surface of the earth would not anywhere—even at the equator—ever register above 90° F.; there would be no frost within 35° or 40° of the equator, and zero temperatures would be recorded only in regions within 30° of the poles. If it were all land the heat would be much more intense than now in the tropics, and in the temperate and frigid zones the heat of summer and the cold of winter would reach extremes unknown at this time.

All the anomalies of climates are caused by the different specific heat capacities of land and water; their different powers of conduction and radiation; the irregular distribution of these two surfaces; the widely-varying elevations of the land; the trend of mountain ranges; the prevailing direction of the winds, and the carrying of large quantities of heat by ocean currents from the equator toward the poles, and the relative quantities of cloud and rain or snow. It is germane to a proper understanding of climate to know something in detail of the manner in which the air is heated. At 100 or 200 miles above the earth's surface there is only the hypothetical ether, which, while too tenuous to be detected or measured by any methods or appliances so far known, is supposed to be the medium that transmits solar energy to the earth and diffuses it through space. This energy, coming in many different wave-lengths and with widely varying intensities of vibration, produces several different phenomena as it is absorbed by or passes through the air, or as it impinges on the surface of the earth. The waves differ in their effects on different objects, depending on the length and the absorptive response of the substances upon which they fall. The waves have heating, lighting, and chemical effects simultaneously in themselves, and it is only the nature of the objects upon which they fall that tends to differentiate them. The atmosphere, even at the surface of the earth, absorbs but a small part of the heat-waves. They therefore reach the earth and warm its surface; and the earth in turn, by radiation, convection, and conduction, sends back into the air long heat-waves, which, unlike the shorter solar waves, are readily absorbed by the atmosphere. The atmosphere is thus warmed from the bottom upward. This accounts for the perpetual freezing temperatures of very high mountain

peaks, although they are nearer the sun than are the bases from which they rise. At the height of one mile in free air the temperature is about the same at midday as at midnight. Only during recent years have we begun to realize how extremely thin is the stratum of air next the earth that has sufficient heat for the inception, growth, and maturity of both animal and vegetable life. The raising of the thermometer shelter at the New York City observatory from an elevation of 150 feet above the street to an elevation of 300 feet, has caused an apparent lowering of the mean annual temperature of 2.5° F. On the hottest day in summer, if one could be lifted up to a height of only 1,000 feet in free air, he would find a marked change in temperature. The United States Weather Bureau at 16 stations made a total of over 1,200 kite observations in the United States in 1897. They showed an average decrease of 7.4° F. for the first 1,000 feet of ascent during the warm months, and when the observations were taken near the hour of daily maximum heat the decrease was frequently as much as 15° . At the height of six miles the cirrus clouds common to this level are, on account of the low temperature, always composed of minute ice spiculæ, never of watery droplets like the lower cumulus clouds. In the middle latitudes of both hemispheres the air at this height is ceaselessly rushing toward the east, passing uninterruptedly over the cyclonic and anti-cyclonic systems that cause our storms and cold waves at the surface of the earth. Glaisher and an assistant ascended to a height of about 30,000 feet. They suffered greatly from the cold, which measured many degrees below zero, although the time of year was 5 September. At the height of six miles the average temperature, determined by many balloon ascensions is about -50° F.

The difference between continental and marine climates is marked. The same amount of heat will raise the temperature of a land surface four times as high as it will raise that of a water surface. Land is a good absorber and a good radiator, but it is a poor conductor and a poor reflector. The absorbed heat does not penetrate into the ground to any great depth. The land, therefore, retains its absorbed heat near the surface and quickly and freely radiates that which it has absorbed. These conditions give to large land surfaces much higher temperature during the day, and much lower temperature during the night, than obtain over a water surface of the same latitude and much colder winters and much warmer summers. As an illustration, it may be stated that the Bermuda Islands, in the North Atlantic Ocean, have a mean daily range of temperature of only 10° F., and an annual range of only about 50° ; while Memphis, Tenn., near the same latitude, in the interior of a large continent, has a daily range of 17° and an annual range of 112° . At Memphis a temperature of 104° has been recorded in summer and -8° in winter. At Bermuda the temperature generally reaches 90° during the summer, but very rarely exceeds that figure, while temperatures below 45° are also very infrequent. The two places are typical of continental and of marine climates. All regions bordering closely on the sea partake of both climates, the predominating one being determined by the direction in which the coasts

CLIMATE

trend, their elevation, and the direction and force of the prevailing winds.

In the middle latitudes of both hemispheres the prevailing winds are from the west, and therefore continents lying in these regions have a marine climate in their western coastal regions, where the air moves from the water to the land, and nearly continental climate in their eastern coastal regions, where the general movement of the air is from the land to the sea.

The distance to which moist and equable air conditions extend inland is determined by the elevation of the land and its trend relative to the incident winds, and the proximity of mountain ranges. The humid air from the Pacific meets the lofty range that skirts the western shoreline of both North and South America; it is forced up the mountain side until the cold of high elevation and the cooling of the air by expansion as it ascends cause it to precipitate its moisture mostly upon the western side of the mountain, and it passes to the interior of the continent bereft of that life-giving moisture which, were it not for the intervention of the mountains, would spread a mantle of luxuriant vegetation 1,000 miles inland. If the disintegrating effects of temperature and rainfall had worn down the Sierras, the Plateau, and the rugged crags of the Rocky Mountains to the height of the Appalachians, the vaporous atmosphere of the Pacific would flow eastward far more freely than now, and meet that which, by the convectional action of cyclones, is frequently carried from the Atlantic Ocean and the Gulf of Mexico inland to the Mississippi valley; then rain would be more abundant and the whole of the United States would have arable land.

To give a further idea of the effect of mountain systems on the climates of continents one needs only to reverse the conditions just mentioned; if the Appalachian Mountains were as high as the Rocky Mountains, and if they extended farther southward and bordered the Gulf of Mexico, then the Ohio River, the Mississippi, and the Missouri and their many tributaries would not exist, and the world's greatest granary would be a gray and nearly barren plain.

The specific heat of water is greater than that of almost any other substance. It requires ten times the quantity of heat to raise a pound of water one degree than it does to raise a pound of iron one degree. Solar rays penetrate the sea to a considerable depth; they are quite uniformly absorbed by the stratum penetrated. In consequence of these laws and conditions a vast quantity of heat is stored by the ocean in the tropics and slowly given to the air as the ocean currents carry the warm water toward the poles. In this connection the writer would correct what he believes to be an exaggerated popular idea relative to the effect of the Gulf Stream on the climate of Europe. The North Atlantic circulation, flowing northward on the western side of the ocean (except a southward current from Davis Strait that chills Labrador and somewhat affects the temperature of the New England coast), and southward along the coast of Europe, is many times more effective in modifying climate than is the Gulf Stream. That the western part of Europe is warmer, more humid, and subject to less radical changes in temperature than equal lati-

tudes in North America, except on the Pacific coast, is due primarily to the great ocean that lies on the west of Europe. Without ocean currents of any description, this body of water would give to the air that moves from it to Europe a more equable temperature than is possessed by the eastern part of the North American continent. Continents, therefore, partake largely of marine climates on their western borders, and principally of continental climates on their eastern borders.

Climate affects the health, happiness, and well-being of people more than any other condition that goes to make up their environment. Within the broad confines of the United States there are many, but not all, shades and varieties of climate. One of the questions most frequently asked is, "Where shall I find a climate possessing both dryness and equability of temperature?" To this interrogatory reply must be made that the ideal climate as regards equability of temperature and absence of moisture does not exist in the United States, but that the nearest approach to it will be found in the great Southwest.

The temperature of the Southwest is not equable in the sense of having an extremely small daily range, but it possesses the quality of annual uniformity in a greater degree than will generally be found elsewhere except on the seacoast, and there the humidity is great.

The most equable temperature on the globe will be found on the high table-lands and plateaus of the tropics. Santa Fé de Bogota, in the United States of Colombia, has an average temperature of about 59° F. for all months of the year, and the range for the entire year is less than is often experienced in a single day in some parts of the middle latitudes. But while the ideal temperature may be found on the higher elevations of the tropics, the rainfall is much greater and more continuous than in this country.

The temperature of a place depends chiefly on three conditions,—latitude, elevation, and contiguity to large bodies of water. At sea level in the tropics extreme conditions of heat and moisture produce very great physical discomfort. But even under the equator it is possible to escape the tropical heat of low levels by ascending from 4,000 to 6,000 feet. In the economy of nature there is a certain limit beyond which the two extremes, dryness and equability of temperature, cannot coexist; thus we may find a region so deficient in moisture as to satisfy the requirements of the case, but the very lack of moisture is a condition that facilitates radiation and thus contributes to great extremes of temperature. Regions may be found, as on the lower Nile, where there is a lack of rainfall coupled with a high and moderately uniform temperature. The mean winter temperature of Cairo, Egypt, is 56° F.; mean summer temperature, 83°; a range from winter to summer of 27°. The mean winter temperature of Phoenix, Arizona, is 52°; mean summer temperature, 87°; a range of 35°. It is by no means difficult to find a counterpart of the far-famed Egyptian climate in the great Southwest.

The dryness of the air and the clearness of the sky are the conditions upon which daily ranges of temperature depend; the greater these, the greater the range of temperature

CLIMATE

from day to night. While a high summer temperature is characteristic of the Southwest and other portions of the Rocky Mountain plateau, it is a fact that the sensation of heat as experienced by animal life there is not accurately measured by the ordinary thermometer. The sensation of temperature which we usually refer to the condition of the atmosphere depends not only on the temperature of the air, but also on its dryness and the velocity of the wind. The human organism, when perspiring freely, evaporates the moisture of its surface to the dry air of the interior arid regions, and thus lowers its temperature and prevents sunstroke, which, in the more humid regions from the Mississippi valley eastward, occur in great number with the air temperature much less than obtains in the West.

The meteorological instrument that registers the temperature of evaporation, and thus in some measure the actual heat felt by the human body, is the wet-bulb thermometer. The latter, as indicated by its name, is simply an ordinary mercurial thermometer whose bulb is wetted with water at the time of observation.

Effect of Climate on the Races.—Climate is the most potent of any factor in the environment of races. It is climate and soil, plus heredity and form of government, that produce either vigorous or weak peoples. In this respect it is a question if the United States does not possess a constant potential that, all other conditions being equal, places it in a class by itself.

Climate, soil, and good heredity may produce a race large of stature and of great physical endurance, but unless such a people exists under a liberal form of government, in which public education is fostered and the arts and sciences taught, it is unable to employ its strength in those lucrative vocations that alone give a high per capita of wealth; and wealth means power. It is also weak in defending itself, either in war or in commerce, against a people of less numerical strength that is liberally educated, skilled, and humanely governed.

If one reads of the overthrow of political dynasties and the subversion of trade and commerce, it will occur to him that the northmen have usually been conquerors. If we consider the invigorating effect of cold air and marked changes of temperature alone we might expect to find the strongest and most resourceful peoples inside of the Arctic circle; and if we consider fruitfulness of soil alone we might reasonably expect to find the dominant peoples in the tropics. But the fact is that the greatest human potentiality occurs somewhere between these two extremes. The boundaries cannot be accurately determined by the naming of certain parallels of latitude, but a close approximation is made to the truth in the statement that the most vigorous people physically and the most resourceful mentally will be found in the most northerly regions that will produce not simply cereal crops, but an abundance of them.

The sweep of the cold wave, as it is known in the United States, is quite distinctly North American. Nowhere else on fertile plains, unless it be in Russia, does the temperature show such wide oscillation within such short periods of time, nor do the icy blasts sweep over such a broad area. It is probable that much of the physical and the intellectual energy that have

caused the United States to excel in agriculture, in manufacturing, and in commerce were caused by the invigorating effect of the cold, dry, highly electrified air of the North American cold wave. The anti-cyclonic systems of air that constitute cold waves have a marked downward component of motion. This motion brings from a considerable altitude to the surface of the earth some of the high electrical potential of the upper air, which is strongly stimulating to man and to other forms of animal life. These cold north winds have a much greater specific gravity than warm and humid winds, and this condition, added to the force with which they come, scatter and diffuse the befouled air near the surface of the earth. Enough has been said to indicate that climate is nearly as important a part of the environment of animal life as it is of the vegetable existence, and that a wide range of annual temperature, if it be not so great as to limit the production of cereal crops, favors the development of strong races of men.

Change of Climate.—Notwithstanding the popular notion to the contrary, there is reason to believe that there has been no appreciable change in the climate of any large area within the period covered by authentic history. Changes in the surface of the earth may be noted within the lifetime of an individual, that are thought to prove that a change of climate has taken place, when the alterations may be due to the persistent action of freezing, thawing, rainfall, and flood. Great changes have occurred during geologic periods, but it is the opinion of the writer that they take place so slowly that thousands of years must elapse before their effect is measurable.

Effect of Forests on Climate.—Extremes of temperature, both heat and cold, are slightly less over forests than over open regions, but the most important effect of forests on climate is the economic conservation of precipitation, diminishing the intensity of floods by restricting the flow-off, and by shading the snow deposited during the winter from the increasing sun of spring and early summer. More moisture is absorbed by the soil when it is covered by forest than when it is cleared of its forest cover, and it follows that deforestation, if extensive, may diminish the supply of springs and streams.

Investigations in Germany and in India seem to indicate that there is an appreciable increase in rainfall as a result of reforestation. In general forests may be looked upon as the effect rather than the cause of rainfall.

Climate and Animals.—The geographic distribution of animals is doubtless the outcome of definite laws—laws that stand in close relation with the past history of the earth through a large portion of geological time. What those laws are forms a subject of great importance in studies of evolution,—a subject, it may be remarked, entirely too great to be adequately treated in the present connection. Naturalists are generally of the opinion that all animals have been produced from those that preceded them by some slow process of transmutation or development, and that this modification of animal forms took place very slowly, as evidenced by the fact that the historical period of nearly 4,000 years has hardly produced any perceptible change in a single species. That marked

CLIMATE AND CLIMATIC SPECIES AND VARIETIES

changes in the climate of the earth have occurred during the remote past there can be no doubt, and that those changes left a marked impress upon the fauna of the globe there can also be no manner of doubt. The great northern ice sheet and the accompanying cold of the glacial period, if it did not cause the extermination of the receding fauna, doubtless led to its migration to more congenial climates.

The part played in the faunal distribution of the globe by the present climate seems to be indirect rather than direct, although there are many facts which seem to point to a direct relation. While it is true that the fur-bearing animals of the frozen north are generally to be found in arctic regions, yet they send their representatives far into the temperate latitudes, and indeed into the borders of the regions inhabited by the more exclusively tropical species. On the other hand, the tiger, whose home is naturally associated with the hot districts of India and the Indian Archipelago, is equally at home in the elevated regions of the Caucasus and the Himalayas, where his footprints are not infrequently found impressed in fields of snow. Other groups of animals are more limited in their migrations. Some are so closely adapted to an arboreal life that they never stray far beyond the limits of forest vegetation, while others are so tolerant of climatic change that the limit of their possible range is conditioned only by the character and quantity of the food supply and the interposition of impassable physical barriers.

Climate and Plants.—The factors necessary to the development of plant life are light, heat, soil, and moisture. The ideal conditions as regards these essentials do not usually obtain, or, if they do, multitudes of plants seek to take possession of the region, so that there is a continuous struggle for existence in which many more plants fail than succeed.

The climatic factors heat and moisture are combined in several ways in different parts of the globe, and these combinations give widely different vegetation; thus a maximum of heat and a minimum of water give desert conditions where only specially adapted plants can exist. If, on the other hand, a maximum of heat is combined with a maximum of water, the result will be vegetation such as exists only in the rainy tropics. The possible combinations of the two climatic factors are very numerous, as are also those of soil and the effects of animal life and human agencies. Yet the vegetation of the globe is susceptible of a fairly definite classification. Following Humboldt, and adopting such terms as express in a general manner the vegetation characteristic of each zone, we have the following classification:

Zones of	Average Temperature
1. Palms and bananas.....	78°—82°
2. Tree-ferns and figs.....	73°—78°
3. Myrtles and laurels.....	68°—73°
4. Evergreens	60°—68°
5. Deciduous trees.....	48°—60°
6. Conifers.....	40°—48°
7. Lichens, saxifrages, and dwarf shrubs.....	32°—40°
8. Lichens and mosses.....	32° and below

While in a general way these zones stretch around the world in wavy belts, somewhat as

do the isotherms, similar belts may be found encircling mountain peaks and chains with increasing altitude above sea-level. Indeed it is possible to pass successively from tropic to arctic vegetation on a single mountain peak in the tropics.

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Climate and Climatic Species and Varieties. Although a half century ago it was generally held that changes of climate have not profoundly affected organisms, yet the recent detailed study of variation has shown that climate and local influences have been the causes of origin of probably a very large number of the species contained in our museums and described in biological literature. Among insects, birds, and mammals it has been estimated that from a third to a half of the known species are climatic or local species or varieties, or local races. As is well known, Americans born of foreign parentage are larger than their ancestors, whether English, Irish, Germans, or French; and Boroditch has shown that the children of Americans of both sexes born in the United States, are larger than those of foreign races. This is generally attributable to difference in the climate of the Old and New Worlds, our American climate being drier, more changeable and stimulating than that of Europe. It appears that the introduced English sparrow has undergone a gradual modification since its introduction into this country about 40 years ago. Bumpus has critically examined over 1,700 eggs of this bird, one half from England and the other half from Providence, R. I. It was found that the eggs of the American race or breed vary more than the European, that they are smaller and of a strikingly different shape, being more rounded and with a much greater amount of color variation. This is attributed by the author to a suspension of natural selection. However, this may be, it belongs with the class of facts which show that the modification is primarily due to the change from one climate to another. Cockerell has found that a common European snail (*Helix nemoralis*), introduced into this country soon begins to present variations not known to exist in England, while in the introduced butterfly, *Pieris napi*, 12 American varieties, and of *P. rapæ* four varieties have appeared on American soil within the few years which have elapsed since their appearance and spread on this continent. Where different mammals are transported from temperate to tropical countries the wool tends to become replaced by hair, and other changes occur. The turkey does not vary in temperate regions, but when acclimated in India it degenerates in size, is incapable of rising on the wing, becomes black, and with the long pendulous appendages over the beak enormously developed. Cold has naturally the inverse effect, mammals transported to the

CLIMATE IN THE TREATMENT OF DISEASE

north from the tropics become more or less woolly. As the result of the severe winters and the elevation of Angora in Asia Minor, the cats, shepherd dogs, goats and hares are clothed with a long fleece like wool.

Islands present different climatic features from the mainland being damper, etc., and hence the birds, reptiles, and other animals present slight but constant differences from their allies and probable ancestors on the nearest continents. And not only that of the same group as in the Galapagos Islands, but also each island is tenanted by a distinct local variety of birds. This has also been noticed by Wallace in the East Indian archipelago. The swallow-tail butterflies of islands tend to have shorter tails, and the outlines of the wings differ. Thus the local races become incipient species, and by being isolated are prevented from crossing with the original stock or species, and in this way geographical varieties or representative species are produced. When great changes have taken place in the topography, portions of land cut off from the continent, or continents become divided, species have arisen. Thus in the late Tertiary, Asia and America were continuous, but when Bering Strait was formed, the bison of this country and that of Europe (aurochs) became specialized, becoming different species. In this way multitudes of species have probably arisen over all parts of the world.

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Climate in the Treatment of Disease.

The relations of climate to medicine are peculiarly significant. The influences of heat, cold, moisture, and sunlight are definite, and to many individuals, sound as well as unsound in mind and body, the problem of life's continuance depends on their climatic surroundings. Many people can live with comfort in Colorado who would die of tuberculosis in a comparatively short time in the Eastern States. Nor is tuberculosis the only diseased condition that demands a certain climatic environment. Chronic emphysema, Bright's disease, heart disease, etc., may be influenced for good or for evil by climate.

Medically speaking, climates may be divided into a number of arbitrary classes. Manifestly such are subject to an immense amount of variation. A physiological classification given by Solly is into the following groups. Sea climates, on the ocean, on islands, or on the coast; land climates, low, up to 2,500 feet; medium, 2,500 to 4,500 feet; high, 4,500 feet and over. Again, climates may be sub-divided into cold and hot, either being dry or moist. All such classifications are arbitrary, and their exceptions to general rules are many.

Ocean climates vary according to the latitude, and the proximity to the Gulf Stream. Apart from such particulars, however, ocean climates are characterized by their equability, not only in the daily range of temperature, but, winter and summer as well, the presence of a large body of water, tends to equalize temperature, moisture, winds, etc. Humidity is a second feature of ocean climates. The moisture in the air acts as a veil, as it were, and this mitigates the fierce heat, and at night gives up the heat to the air. High grades of humidity with great heat are extremely prostrating. Sea

air is impregnated with the vapors of salt, and perhaps those of iodine and bromine, and it is free from dirt and bacteria. Ozone is always great in amount. Ocean climates are apt to be soothing. They increase the appetite greatly; there is increased inclination to sleep and increased bodily metabolism. When not too bracing and exciting, ocean climates are well adapted to the treatment of neurasthenia.

Island climates, if the islands are not very large, are practically ocean climates. Coast climates partake of a double nature. Because of the disturbing influences of increased land heat radiation, coast climates are less equable. They are usually less humid, precipitation being more active; winds often play a very important factor in coast climates, hence a knowledge of the local conditions is essential to estimate correctly the qualities of any given coast climate, although all coast climates bear a family resemblance to ocean climates.

Low inland climates are usually characterized by high barometric pressure, lessening with the elevation, and more or less humidity, becoming less as the distance from the ocean increases. Mountain ranges modify this greatly, as in California, for instance, where the Coast Range causes the precipitation of moisture on one side of the range, leaving the other side very dry although very close to the sea. The driest, low inland climates are those usually in the interior of the continent; the proximity of large bodies of inland water, however, modifies these. The moist, inland, low climates that are warm are the poorest for therapeutic purposes. They are enervating, depressing, and mosquito-ridden, hence malarious and noxious in many particulars. The moderately moist and warm climates, such as are found in Florida, for instance, and in many coast regions, as southern California, act as sedatives to the nervous system and are excellent in neurasthenic conditions. They are adapted to convalescents and to chronic invalids, particularly in Bright's disease, tuberculosis, and chronic cardiac troubles.

Moderately moist and cold climates, such as are found at Saratoga, in the Adirondacks, in Wisconsin, at Baden-Baden, Wiesbaden, etc., may be called indifferent climates. They are valuable as changes, and, being near large centres of population, are readily reached, and amusements, games, etc., with good regimen, work benefit to those who have been overdoing. Moist and cold climates are not desirable therapeutically. Tuberculosis abounds in such climates.

Dry and warm climates are found in west Africa, Egypt, Nubia, southwestern Texas, southern California, and the less elevated regions of Utah and Arizona. Tuberculosis, chronic joint conditions related to rheumatism, Bright's disease, heart disease, neuralgias, and neurasthenias, all do well in this type of climate. It seems, as an all-around climate, the best type. Thus far in the United States the comforts to be found in cities with this climate do not commend themselves to travelers. European and African travel is much preferred, although there is little question but that the American resorts are their equals from a climatic, but not from an historic point of view, nor from "comfort to the traveler" standpoints.

Mountain climates are characterized by clean air, low humidity, increased light ozone, and

CLIMAX — CLINGMAN'S DOME

rarefied air. The effects on the body by the rarefied air are marked. There is increased respiratory activity, and increased heart action, that later may become irritable. Persons in good health usually accommodate themselves, but the aged and weak are inconvenienced by high climatic conditions. Sleep is usually improved in those able to accustom themselves to the changed conditions, and muscular and nervous power is increased thereby. To the overworked business man, a rest in the not too high mountains, if his heart can stand exercise in the rarified air, mountain climates are excellent. Consult: Hinsdale and Weber, 'Climatology.'

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Climax (Gr. κλιμαξ, a ladder or stairs), a rhetorical figure in which a series of propositions or subjects are presented in such a way that the least impressive comes first, and there is a regular gradation from this to the most impressive or final; opposed to "anti-climax," in which the ideas are presented in the reverse order.

Climbing-fern (*Schizæaceæ*), a family of ferns, mostly tropical, which have various peculiarities. It contains 5 genera and 75 species, two of which are represented in eastern North America. One, *S. pasila*, or curly grass, is a rare fern sometimes found in wet soil in the pine barrens of New Jersey during the months of August and September. The other is the Hartford fern (*Lygodium palmatum*), occurring in most thickets and open woods along the eastern seaboard of the United States during the summer months. The plant is a slender and flexible climber, with palmate leaves, surmounted by a panicle of forked pinnules, making it a very desirable decorative house-plant.

Climbing-fish, or **Climbing-perch**, a spiny-rayed fish (*Anabas acandens*) belonging to the family *Anabantidæ* which, with the *Osphromenidæ* constitute the sub-order *Labyrinthici*, characterized by the enlarged and peculiar labyrinthine structure of the superior pharyngeal bones, which are formed of excessively delicate plates of bone covered in life by a moist membrane and enclosing air-spaces between them.

In the climbing-perch the labyrinthine organ is greatly developed and extremely complex, and serves as an air-breathing organ of such great importance that the fish readily suffocates if prevented from having access to the air. To a fish which inhabits small stagnant pools, where the water contains but a small supply of dissolved air, such an apparatus is almost indispensable, and the climbing-perch, like a number of other fish which live in similar situations, regularly breathes free air. It has the very remarkable habit of leaving the water, especially during rains, and ascending the trunks of palm-trees for as much as six or eight feet, for the purpose of capturing insects. This habit is so well known to the natives of the East Indies that their name for the climbing-perch is said to mean "the fish that climbs trees." The early accounts were, however, received with much skepticism, but have been fully and repeatedly confirmed. The feat is accomplished partly by means of the tail and spiny anal fin, but chiefly through the peculiar structure of the gill-cover,

of which the opercular bone has a serrated edge, which clings firmly to surfaces, and the sub-opercular is so freely movable that it serves the purpose of a sort of leg, first extended forward and attached, then by appropriate muscles the body is advanced an inch or so at a time. The climbing-perch and all related forms are found only in the Indian and Indo-Malayan region.

Climbing Plants. See LIANAS.

Clinch, Charles Powell, American poet and play-writer: b. New York 20 Oct. 1797; d. there 16 Dec. 1880. For many years he was editorial writer, and literary and dramatic critic for the press; also writer of many poems, theatrical addresses, and dramas. Among the latter are: 'The Spy'; 'The Expelled Collegiates'; and 'The First of May.'

Clinch River, a stream that rises among the hills in the southwest part of Virginia, passes into Tennessee, flows through the valley between Clinch Mountain and Powell Mountain, and unites with the Holston at Kingston, to form the Tennessee. Its length is estimated at above 200 miles, for more than half of which it is navigable by small boats.

Cline'dinst, Benjamin West, American artist: b. Woodstock, Va., 1860. He is a painter of portraits and pictures in the genre style, and in 1900 was awarded the Evans prize of the American Water Color Society. He is best known as a popular illustrator of stories in the leading illustrated magazines, the 'Century,' 'Harper's Magazine,' and 'Scribner's Magazine,' especially containing much of his work.

Cling'man, Thomas Lanier, American senator: b. Huntsville, N. C., 27 July 1812; d. Raleigh, N. C., 4 Nov. 1897. He graduated at the University of North Carolina 1832, adopted the legal profession, and was a member of the State legislature 1836-40. He was elected to Congress as a Whig and with the exception of the 29th Congress, served continuously from 4 Dec. 1843 to 14 June 1858, when he was appointed United States senator. During his service in the House he took part in all the leading debates, not missing, it is said, a single day's session, and for a time was chairman of the Committee on Foreign Affairs. His speech on the causes of Henry Clay's defeat, led to a duel with William L. Yancey. He later joined the Democratic party. Entering the Confederate army as a colonel, he was promoted brigadier-general 17 May 1862, commanding the North Carolina troops, and served until his surrender with Gen. J. E. Johnston in April 1865. After the War he was chiefly engaged in mining and scientific pursuits. He made contributions to the sciences of geology and mineralogy, and in 1855 measured and made known the highest point in the North Carolina Mountains, since called "Clingman's Peak," and in 1858 determined the highest point of Smoky Mountain, now called "Clingman's Dome." The important mica mines in Mitchell and Yancey counties were first opened by him. He published a volume of 'Speeches and Writings' (1877); 'Follies of the Positive Philosophers' (1878); and 'The Tobacco Remedy' (1885).

Clingman's Dome, a peak of the Smoky Mountains, near the boundary between Tennessee and North Carolina. It was so named

CLINIC — CLINTON

in honor of Thomas L. Clingman. Its height is 6,619 feet above the sea-level.

Clin'ic, a place in which practical instruction in medicine is given; also the process of instruction. Clinics are usually held in dispensaries, where, by reason of free treatment, many patients congregate, thus affording good clinical material.

Clink-stone (so named from its sonorousness), grayish felspathic rock of the trachytic group, with a slaty structure, and generally divisible into tabular masses that are sometimes used as roofing-slates.

Clinometer, klī-nōm'ē-tēr, an instrument used for taking the dip and strike of rock strata. In its commonest form it consists of a sort of protractor with a pendulum attached. When the clinometer lies horizontally the indicator points to 0°, and when inclined the amount of inclination is shown at once by the pendulum. It is most convenient to combine compass and clinometer in one instrument.

Clinopo'dium, a genus of herbs or low shrubs of the mint family (*Labiatae*), containing about 50 species, of which 9 occur in the southeastern United States and California. The plants are known under the common names of wild basil, calamint, bed's-foot, and basil balm.

Clinton, Charles, American colonist, ancestor of the Clintons in New York: b. County Longford, Ireland, 1690; d. Ulster, now Orange County, N. Y., 19 Nov. 1773. His grandfather was an adherent of Charles I., and after the defeat of the royalists fled for refuge to the north of Ireland; and his mother was daughter of a captain in the parliamentary army. Having determined with a number of his friends to emigrate to America, he chartered a ship, and sailed for Philadelphia 20 May 1729. After a passage marked by the attempt of the captain to starve the passengers in order to possess their property, and in which after the death of several, among whom were a son and daughter of Mr. Clinton, it was proposed, but not attempted, to wrest the command from the captain, he was landed with his companions 4 October at Cape Cod. The place for a permanent settlement was selected in the spring of 1731 in Ulster County, N. Y., about 6 miles west from the Hudson River, and 60 miles north from New York. Clinton was chiefly occupied as a farmer and land surveyor, but was also judge of the county court, and in 1756 was appointed lieutenant-colonel, and served with two of his sons in the expedition against Fort Frontenac.

Clinton, De Witt, American statesman: b. Little Britain, New Windsor, Orange County, N. Y., 2 March 1769; d. Albany 11 Feb. 1828. His descent on the father's side was from English ancestors long domiciled in Ireland, and on the mother's side he was of French extraction. His education was begun in a grammar school near his home, continued at the academy in Kingston, Ulster County, and completed at Columbia College, where he bore away the college honors in 1786. He immediately engaged in the study of the law and was admitted to the bar in 1788. His ardent temper and earnest ambition carried him at once into the political field, and his sentiments, sympathies, and affections determined his position under the banner of his kinsman, George Clinton, the chief within the

State of the Republican party. While the question of the adoption of the Federal constitution was yet a subject of popular discussion, he proved his zeal and controversial power by writing a series of letters signed "A Countryman," in reply to the celebrated letters of the 'Federalist.' He entered the legislature in 1797 and the State Senate in 1798, soon becoming the leader of his party in the State. In 1801 he became United States senator, resigning in 1803 to assume the office of mayor of New York. He remained undisturbed in the mayoralty from 1803 until 1807, when he was removed. He was reappointed in 1809, was displaced in 1810, was restored in 1811, and thenceforward continued therein until 1815. Within this period of nearly 12 years, Clinton was also a member of the Senate of the State from 1805 until 1811, was lieutenant-governor from 1811 to 1813, and during a portion of that time also held a seat in the council of appointment. He was an unsuccessful candidate for the Presidency in 1812. He adopted early and supported ably and efficiently the policy of the construction of canals from Lake Erie and Lake Champlain to the tide-water of the Hudson, and showed to his fellow citizens, with what seemed a spirit of prophecy, the benefits which would result from those works to the city, the State, and the whole country, in regard to defense, to commerce, to increase of wealth and population, and to the stability of the Union. In 1815 he presented a memorial to the legislature in behalf of the construction of the Erie Canal and in 1817 a bill was passed authorizing the work. In 1817 he was elected governor of New York and re-elected in 1820. He declined re-election in 1822, but was again elected in 1824, and after overcoming constant, unremitting, and factious resistance, he had the felicity of being borne, in October 1825, in a barge on the artificial river which he seemed to all to have constructed from Lake Erie to the bay of New York, while bells were rung and cannons saluted him at every stage of that imposing progress. No sooner had that great work been undertaken in 1817 than the population of the State began to swell with augmentation from other States, and from abroad; prosperity became universal; the older towns and cities expanded, new ones rose and multiplied; agriculture, manufactures, and commerce were quickened in their movements, and wealth flowed in upon the State from all directions. He was re-elected governor in 1826, dying while in office. Consult Hosack, 'Memoir of De Witt Clinton' (1829); Renwick, 'Life of De Witt Clinton' (1840); Campbell, 'Life of De Witt Clinton' (1849).

Clinton, George, Vice-President of the United States: b. Little Britain, Ulster County, N. Y., 26 July 1739; d. Washington, D. C., 20 April 1812. He was a son of Charles Clinton (q.v.) and served as lieutenant under his brother James at the capture of Frontenac, but afterward studied law. He was a member of Congress in 1776, and voted for the Declaration of Independence, but was summoned to the army as brigadier-general before it was prepared for signature. In 1777 he was elected governor and at the same time lieutenant-governor of the State of New York, which latter office was, on his acceptance of the other, conferred upon Mr. Van Courtlandt. He held the office of governor during the next 18 years, for which

CLINTON

eventful period the history of his life is that of the State. He was again chosen governor after spending five years in private life, in 1801, and in 1804 became Vice-President of the United States.

Clinton, Sir Henry, English general: b. about 1738; d. Gibraltar 23 Dec. 1795. He was the grandson of Francis, sixth Earl of Lincoln, served in the Hanoverian war, and was sent to America as major-general in 1775. He took part in the battle of Bunker Hill, and in the battle on Long Island which resulted in the evacuation of New York by the Americans; was made Knight of the Bath in 1777, proceeded up the Hudson that year in a vain effort to relieve Burgoyne, and was promoted to the chief command of the British army in America in 1778. After being forced by Washington to evacuate Philadelphia, he commanded an expedition to South Carolina in 1780, and blockaded and captured Charleston. He sailed from New York with 7,000 men to relieve Cornwallis on the very day that the latter capitulated. He was superseded by Gen. Carleton in 1781, returned to England the next year, and died soon after he had been appointed governor of Gibraltar. He wrote a narrative of his conduct in America (1782), and a rejoinder to Lord Cornwallis' observations on it (1783); also observations on Stedman's 'History of the American War' (1784).

Clinton, James, American military officer: b. Little Britain, Ulster County, N. Y., 9 Aug. 1736; d. there 22 Dec. 1812. He was the fourth son of Charles Clinton (q.v.). With his father he served at Frontenac, in 1758, as captain, and commanded in 1763 the forces raised to protect Ulster and Orange counties against the Indians. He accompanied Montgomery to Quebec in 1775, and was appointed brigadier-general the following year. While his brother George was governor of New York, he was overpowered at Fort Clinton by the superior force under Sir Henry Clinton, and being severely wounded narrowly escaped with his life. He afterward served against the Indians under Sullivan in 1779 and was present at the surrender of Cornwallis. After the peace he occupied many distinguished civil stations.

Clinton, Canada, a town of Huron County, Ontario, situated on the Buffalo & G. branch of the Grand Trunk Railway, about 32 miles northwest of Stratford. Its industries are numerous. There are salt-wells, a tannery, a grain-elevator, and a flour-mill, and factories for the production of carriages, organs, threshing-machines, fanning-mills, etc. There are several churches and a collegiate institution. Pop. about 3,000.

Clinton, Ill., city and county-seat of De Witt County, situated on the Illinois C. R.R., about 42 miles northeast of Springfield. The chief industry of the region is farming. There are machine shops here, and the city has an electric-lighting system and water-works, several churches and two public schools. Pop. (1900) 4,452.

Clinton, Ia., city and county-seat of Clinton County, situated on the Mississippi River and on the Chicago & N. W., Chicago, M. & St. P., Chicago, B. & O., Chicago, R. I. & Pac., and Iowa Midland, 128 miles west of Chicago and 60 miles southeast of Dubuque.

Industries.—The city is a trade centre for a region of 50 miles radius and has large manufacturing and other industries, including lumber mills, furniture factories, sash and door factories, iron bridge works, gasoline engines, boats, automobiles, wagons, harness, boxes, brick, locks, and railroad machine shops.

Public and Educational Institutions, Etc.—The city has a good public library, hospitals, business colleges, Wartbury Lutheran College, Mount Saint Clare Academy, Our Lady of Angels Seminary, churches of all denominations, public schools, five banks with a combined capital of \$800,000, electric lights and railways and an assessed property valuation of over \$2,000,000.

Government.—The present form of government is by a mayor and a council of nine members elected biennially. Pop. (1903) 23,370.

Clinton, Mass., a town of Worcester County, 12 miles northeast of Worcester and 40 miles west of Boston; on the Nashua River, and the Boston & Maine and N. Y., N. H. & H. R.R.'s.

Industries, Etc.—The chief industries are the manufacture of wire-cloth, gingham, and carpets. Here are located the Lancaster Mills, with 2,100 employees; the Bigelow Carpet Co., with 1,250, and the Clinton Wire-Cloth Co., with 500.

Public Institutions, Buildings, Etc.—There is a national bank, with a capital of \$200,000 and average deposits of \$375,000. The Bigelow Free Public Library contains 25,000 volumes. The churches are Congregational, Baptist, Methodist, Presbyterian, Unitarian, Catholic, and Adventist. There are also the Clinton Hospital and the Clinton Historical Society.

Government.—The government is administered by means of town-meetings. The board of selectmen holds office for three years and appoints the chief of police and other subordinate officials.

History.—Up to 1850 Clinton was a part of Lancaster (q.v.), but it was then incorporated as a town. Pop. (1900) 13,667; (1903 est.) 14,639.

Clinton, Miss., a town of Hinds County, about 10 miles from Jackson. Its only interest lies in its being an educational centre. Among other institutions of learning is Mississippi College (q.v.), with nearly 300 students, and a school for colored students.

Clinton, Mo., a city and county-seat of Henry County, 37 miles northwest of Sedalia, on Missouri, K. & T., the St. Louis & San F., and Kansas City, Clinton & Springfield R.R.'s.

Industries, Etc.—Clinton has 3 flour mills with a combined capacity of 3,200 barrels daily; 2 corn-meal mills, capacity 750 barrels daily; cooperage and railroad division shops, ice plant and foundry and gas-engine factory. It has 2 banks with a combined capital of \$75,000, and has an annual business of \$25,000,000.

Educational Institutions, Etc.—Clinton has an excellent public school system, and also colleges for men and women, including Bind College for Women and Clinton Business College.

Government, Etc.—The city was first settled in 1837, became a borough in 1858 and a city in 1876. It is governed by a mayor and a council of eight members elected for two years. Pop. (1903) 6,000.

Clinton, N. Y., a village of Oneida County, situated on the New York, O. & W. R.R. In

CLINTON BRIDGE CASE — CLITOMACHUS

the neighborhood there are stone quarries. The chief interest of the place lies in its educational institutions. Here is located Hamilton College (q.v.), and there are seminaries for young women, an academy and a union school. Pop. (1900) 1,340.

Clinton Bridge Case, a case in the United States supreme court, December term 1870; a leading precedent as to the rights of railroad traffic *v.* river navigation, although it specifically decided only the right of Congress to take pending adjudications out of the hands of the courts by special acts, and to legalize any bridge as a post-road under its power to control interstate commerce. The Chicago, I. & N. R.R. Company proposed to bridge the Mississippi from Clinton, Iowa, to Albany, Ill., under authority from those States. One Gray filed a bill in equity in the circuit court of Iowa, praying for a preliminary injunction pending hearing for a final injunction, on the ground that the bridge was an obstruction and danger to navigation. Before the final hearing, however, the bridge was built, and Congress passed a special act 27 Feb. 1865, declaring it a lawful structure and a post-route, prescribing rules for the operation of the draw, and providing that all suits for obstruction to navigation should be brought in the circuit court of the State involved. The defendants on final hearing objected to the reading of proofs, on the ground that this statute closed the case, and the court so found. On appeal to the supreme court, the appellant argued that the act did not intend to legalize its maintenance in whatever condition it might be, or bar suits to abate that condition as a nuisance; and that it was unconstitutional if it did, as taking private property without compensation. The supreme court affirmed the judgment of the court below, but admitted that a suit at common law for damages would have raised a different set of questions.

Clinton Stage, in American geology, the middle member of the Niagara Series of the Silurian System. It comprises shales and shaly sandstones with some limestones, and is typically developed at Clinton, N. Y. From New York the series extends southward along the Appalachians to Alabama, reaching its maximum thickness of over 800 feet in Pennsylvania. From the Appalachians the series stretches 1,000 miles westward, except for the area of the Cincinnati anticline, to Wisconsin, where the Series is represented by limestones. From one to three beds of oölitic hematite (fossil iron ore), from 1 to 10 feet thick, are found in the Clinton at many points along the Appalachians and have yielded considerable ore. See IRON ORE; NIAGARA SERIES; SILURIAN SYSTEM.

Clinton's Big Ditch, a phrase applied to the Erie Canal, connecting the Hudson River with the Great Lakes. The name was given in derision because the canal was planned and carried to completion by De Witt Clinton.

Clinto'nia, a genus of plants of the lily-of-the-valley family (*Cornwalliaceæ*), named after De Witt Clinton, naturalist and governor of New York. It comprises six species, four of which are natives of North America, the other two being Asiatic. Yellow clintonia (*C. borealis*), has greenish-yellow drooping flowers, with blue berries. It grows in moist woods

from Newfoundland south to North Carolina, and westward to Wisconsin and Minnesota. The white clintonia (*C. umbellulata*) is found in the woods of New York and New Jersey, and as far south as Georgia, and westward through Tennessee.

Clio, klī'ō, daughter of Zeus (Jupiter) and Mnemosyne (Memory), the muse of history. She is represented with a wreath of laurel upon her head and a roll of papyrus in her left hand. She was the mother of Hyacinthus and Hymenæus. There was also a sea nymph named Clio, daughter of Oceanus and sister of Beroe, who figures in Greek mythology.

Clionidæ, klī-ōn'ī-dē, a family of *Pteropoda* (q.v.), which lack the shell and external gills, have the body spindle-shaped with wing-like fins situated near the head, and the head provided with short tentacles. They are pelagic animals of remarkable transparency, and live in vast numbers in the Arctic and Antarctic seas. Their chief popular interest lies in the fact that one species, *Clio borealis*, although only about an inch in length, furnishes the chief food of the great whalebone whales of the North. The whalers call the schools of these pteropods brit and deem their presence a good sign of whales.

Clipper, the word used to designate a modern construction of large sailing vessel. The peculiarities of these vessels are, their long sharp bow, their greatest beam lying abaft the centre of the ship, and their depth of keel. The speed attained by the opium and slave traders had attracted the attention of naval architects generally, and the shipbuilders of Great Britain (notably those of Aberdeen and Liverpool) and of America vied with each other in producing vessels which, while preserving fair carrying capabilities, should, as the primary requisite, be fast sailers. In this they succeeded to a remarkable extent, and the feats of the Atlantic, Australian, and China clippers, some of which attain an average speed during the voyage of over 15 miles an hour, used to be a topic of great interest and excitement among those connected with shipping and ocean traffic. Owing to the improvements in steam vessels, and the many advantages possessed by them over sailing vessels, clippers, as a special type of ship, are now little heard of.

Clissold, Augustus, English clergyman: b. about 1797; d. Tunbridge Wells, 30 Oct. 1882. He was graduated from Exeter College, Oxford, in 1823 was ordained priest, held the curacies of Saint Martin-in-the-Fields and Saint Mary, Stoke Newington, and about 1840 withdrew from the ministry. He had become a very close student of the writings of Swedenborg, and though retaining through life his connection with the Church of England, he was president of the Swedenborg Association, became a life member of the Swedenborg Society, and liberally assisted it with funds. Clissold translated and published at his own expense Swedenborg's 'Principia Rerum Naturalium' (1845-6) and 'Œconomia Regni Animalis' (1846). He wrote also many original works, the larger part on Swedenborg and Swedenborgian views.

Clisthenes. See CLEISTHENES.

Clitomachus (Gk. *Κλειτόμαχος*), Greek philosopher: b. Carthage about 190 B.C.; d. Athens about 110 B.C. He went to Athens about 146

B.C., where he became identified with the Third, or New, Academy, of whose founder, Carneades, he was one of the most distinguished disciples. On the death of Carneades in 129 B.C., Clitomachus succeeded to the academic chair. Carneades wrote nothing, and Clitomachus was the chief expositor of the system of the New Academy. Diogenes Laërtius is authority for the statement that he wrote 400 books on philosophical subjects. Cicero, who appears to have devoted considerable study to the work of Clitomachus, praises him highly in the 'Academica.' He followed in his teachings the largely skeptical views of Carneades, denying the possibility of attaining absolute truth, or any certain criterion of truth. Of his works there remain only a few titles and some renderings by Cicero in the 'Academica.' See ACADEMICS; GREEK PHILOSOPHY.

Clitus, klī'tūs, son of Dropis, and brother of Hellanice, the nurse of Alexander the Great. He was one of the generals of Philip and Alexander, and saved the life of the latter in the battle of the Granicus by cutting off the hand of Rhosaces, who had just lifted up his arm to kill Alexander. Notwithstanding this service, however, Alexander killed him in a fit of anger at a banquet in honor of Dioscuri.

Clive, Catherine Raftor, KITTY CLIVE, English actress: b. London 1711; d. 6 Dec. 1785. She was the daughter of a poor Irish gentleman living in London, and coming to the notice of Colley Cibber, manager of Drury Lane Theatre, made her début there at 17. She achieved instant success and till her retirement from the stage in 1769 was one of the most popular actresses of the time, her forte being comedy. She married George Clive in 1732, but was separated from him later. She was intimate with many of the literary and social lights of her day, among others Horace Walpole, who presented her with a house at Strawberry Hill. Consult Fitzgerald, 'Life of Mrs. Catherine Clive' (1888); Doran, 'Annals of the English Stage' (1888).

Clive, Robert, BARON OF PLASSEY, English soldier and statesman: b. Shropshire, 29 Sept. 1725; d. London 22 Nov. 1774. His father obtained for him the place of a writer in the East India Company's service, and in his 19th year he went in that capacity to Madras. Two years later Madras surrendered to the French, but Clive escaped to Fort Saint David, where he entered the military service. He took part in the unsuccessful attempt to capture Pondicherry in 1748. When the British opposed Chunda Sahib, whom the French wished to make nabob of the Carnatic, and their candidate was besieged in Trichnopoly by Chunda Sahib, Clive was sent in 1751 to attack Arcot, the capital of the Carnatic, which he captured without opposition, and later compelled a detachment of Chunda's troops to retire. He then relieved Trichnopoly, and captured the forts of Covelong and Chingleput. In 1753 he went to England for a time, and on his return to India (1755) he was given the government of Fort Saint David. He was soon called to Madras to command the relief expedition sent to Bengal, where the nabob Suraj-al-Dowlah had taken Calcutta. Clive took possession of that city, and with a very inferior number of men entered the nabob's camp and captured his cannon. The nabob then offered

terms of peace very advantageous to the English. Clive very shortly formed a plot to dethrone Suraj-al-Dowlah and place Mir Jaffier on the throne. In the famous battle of Plassey (21 June 1757) Clive's force of 3,000 men put to flight the nabob and his army of more than 50,000. Mir Jaffier now wished to govern without British interference, but the rebellions against him forced him to seek the aid of Clive, who was appointed governor of Bengal. Clive again went to England in 1760, where he was raised to the Irish peerage, and was elected member of Parliament from Shrewsbury. A disagreement between Mir Jaffier and the British governor officiating in Clive's absence caused Clive's return to India in 1764. He found the trouble with Jaffier settled, and devoted himself to the reform of the civil service in Bengal, and the restoration of discipline in the army. After his final return to England (1767) severe attacks were made upon him for his conduct in India, and a parliamentary inquiry followed which resulted in the passing of the resolution that he "had rendered a great and meritorious service to his country." But the worry due to the attacks, together with his failing health, so depressed him that he committed suicide.

Cloaca, a sewer, an underground drain or conduit. The Roman Cloaca Maxima (the greatest or main sewer) is said by tradition to have been constructed under the direction of King Tarquinius Priscus (616-578 B.C.), but none of the existing part is older than the 3d century B.C. It is still used in the drainage of Rome. It received numerous other branches between the Capitoline, Palatine, and Quirinal Hills. It is formed of three concentric rows of enormous stones, piled above each other without cement. The height inside is about 13 feet and its width is about the same.

In anatomy a cloaca is a part of the intestine in which the intestinal, ovarian, and urinary outlets terminate. This structure exists in birds, in reptiles, in the amphibia, and in the mammalian order *Monotremata*. In the *Rotifera* also the perivisceral cavity terminates in a dilatation or cloaca, which forms the common outlet for the digestive, generative, and water vascular system. There is a cloaca also in insects, and one also in tunicated mollusks. The latter is sometimes called the atrial chamber. In the embryonic development of man there is a period during which a cloaca also exists.

Clock. All instruments for the accurate measurement of time have three parts in common. One is a vibrating body, which may be a pendulum swinging under the force of gravity, or a balance wheel vibrating on its axis through the action of an elastic spring. The second feature is a source of power, which may be a weight or a stiff steel spring, called the main spring; the object of either is to keep up the vibrations of the balance wheel or pendulum, which would otherwise soon cease through friction and the resistance of the air. The third feature is a system of wheel work by which the power is transmitted from its source to the vibrating body, and by the revolutions of which the time is indicated. The instruments by which these results are brought about may be classified as watches, chronometers and clocks. The watch (q.v.) is a portable form of the instrument, generally so constructed as to be car-

CLOCK

ried in the pocket and moved about into any position without interfering with its going. This requires that the source of power shall be a spring and the vibrating body a balance wheel. The chronometer (q.v.) is a larger and most accurate watch constructed on the same general principles, but intended, when moved, to maintain a horizontal position. The term is sometimes applied to the most accurate pocket watches; and to distinguish it from them the chronometer proper is sometimes called a marine chronometer. The term is chosen because the instrument is used to keep time at sea for the determination of a ship's longitude.

In the original construction of the clock, to which this article is especially devoted, the vibrating body was the pendulum and the source of power a weight which could be wound up with a key. But, in order to secure the advantage of being easily handled and moved about it is now very common to make the smaller class of clocks with either a main spring or a balance wheel or both. But such clocks, unless made in the most expensive way, do not keep time as accurately as those with weight and pendulum; the latter are, therefore, to be preferred in all cases where a clock can be kept in one and the same position, and is wanted to keep fairly good time for considerable periods.

In the earliest instruments of these different kinds the vibrating body was a small horizontal bar, which moved back and forth under the influence of the wheel work. This was before the idea of applying a spring to keep up and regulate the vibrations had been suggested. Such instruments were extremely inaccurate in their results. The possibility of the pendulum clock dates from the time of Galileo, who first showed clearly that a pendulum completed its swings in nearly the same time, whatever its arc of vibration, which time was dependent on its length. But the practical inventor of the pendulum clock was Huyghens, the great Dutch astronomer of the 17th century. He invented the various appliances of the clock, the striking apparatus excepted, in substantially the form that we have them to-day. What is sometimes called the astronomical clock does not differ in principle from the ordinary pendulum clock, and has nothing distinctive about it except that it is made with the greatest perfection throughout, in order to go with the utmost attainable uniformity from day to day. So successful have clock-makers been in recent times that an astronomical clock which varied by one tenth of a second during a day would be regarded as practically useless. A good clock of the kind should keep time within three or four hundredths of a second a day.

The accompanying plate shows in detail the various parts of the ordinary clock. Fig. 1 gives a lateral view of the wheel work. An end view of the mechanism is shown in Fig. 2. P is a weight suspended by a cord which rests in a spiral groove going round and round the main cylinder C. In order that the clock may be wound up at any time, a ratchet wheel DD, Fig. 2, is used with a grooved cylinder, around which is wound a cord carrying the weight. The manner in which the ratchet acts is too obvious to need description. It is to be remarked that, in the ordinary house clock, the action of the wheel work stops while the weight

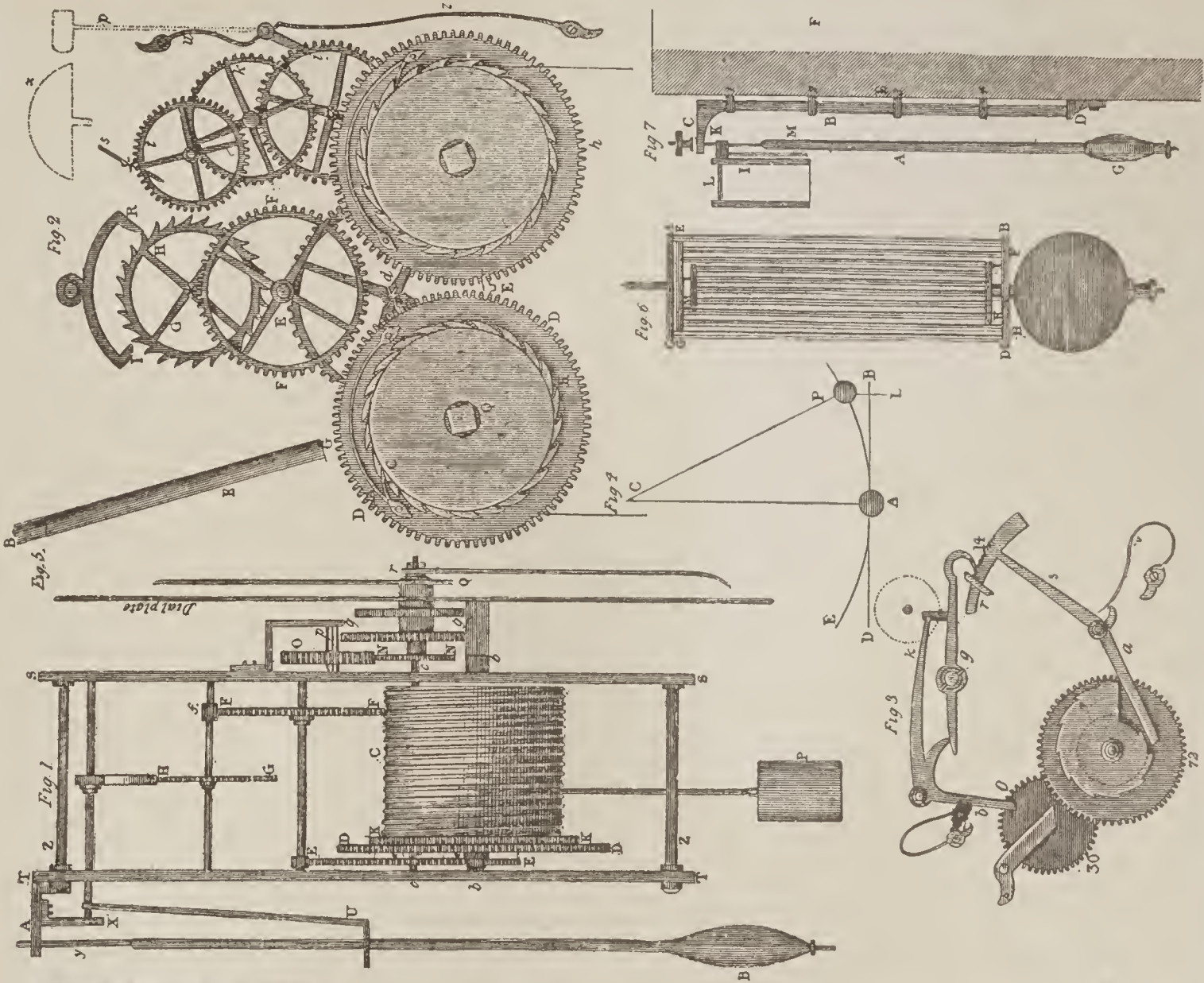
is being wound up. As the clock then loses all the time taken to wind it up, the best class of clocks are constructed with a second ratchet which keeps them going while being wound. The action of the weight is transmitted through the train of wheels d, E and F, to the scape wheel GH, which acts on the pallets IR, connected with the crutch which acts on the pendulum. In Fig. 1 By is the pendulum and its crutch vibrating in a plane perpendicular to that of the paper. In the upper part of its length, which passes through the crutch U, it turns on a horizontal axis which can be seen in the Fig. extending horizontally from the framework of the clock from just above X to the right. Thus, as the pendulum vibrates the arm of the crutch UX vibrates with it. This vibration releases alternately the teeth of the scape wheel GH, a double motion of the pendulum back and forth being required in order that first one tooth and then the other may escape. As shown in the figure the end R of the anchor is moving upwards, the tooth H of the scape wheel being just about to slide off. During the time that the pallet R is holding the scape wheel, the latter slides and presses upon it, thus pressing the side of the crutch against the pendulum. When the tooth H escapes, the anchor is in such a position that another tooth strikes the lower surface of I and acts on that in the opposite direction while the pendulum is swung the other way. Thus the teeth escape alternately, first one and then the other, in regular alternation, gently pressing the pendulum during its swing each way.

The construction of the escapement is of the utmost importance when the best performance of a clock is required. If one examines the second hand of an old-fashioned house clock he will notice that, at the moment of each beat, the second hand moves forward to one second and then has a slight motion backward before the next beat. This backward motion takes place immediately after one tooth has escaped, and continues until the pendulum has sprung to its greatest distance on one side. This backward action throwing extra action on the pendulum tends to accelerate its motion. Hence, good clocks are provided with a "dead beat" escapement invented by Graham. In this form the pallet on which the teeth of the scape wheel first impinges is at right angles to the radius from the centre of motion of the anchor to the pallets themselves. The action of the scape wheel then does not begin until the pendulum reaches a certain point of its downward swing, which point is the same whether the swings are wide or narrow.

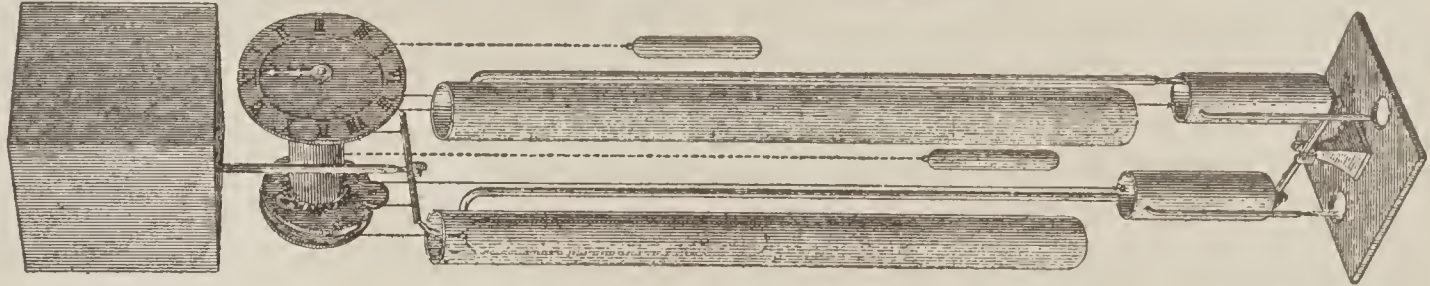
Under the system just described, the pendulum is kept in continuous vibration and the wheel work in continuous motion from the time the clock is wound up until it is run down. But it is also necessary that the clock shall, at every moment, show the time on its face. This is brought about by the wheels O and N, Fig. 1, one of which is arranged to revolve in an hour, the other in 12 hours. The result is too familiar to need any description. If the wheel work which moves the hand were rigidly connected with that of the clock, the latter could not be set without moving the whole of the clock work. The system of wheel work which carries the hands is, therefore, so arranged as

CLOCKWORK.

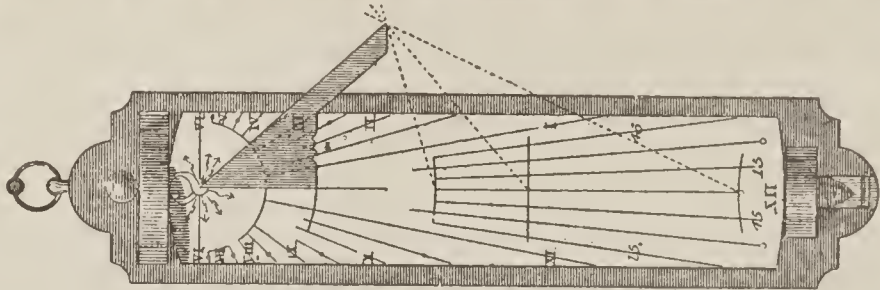
Ordinary Clock movements and Pendulums



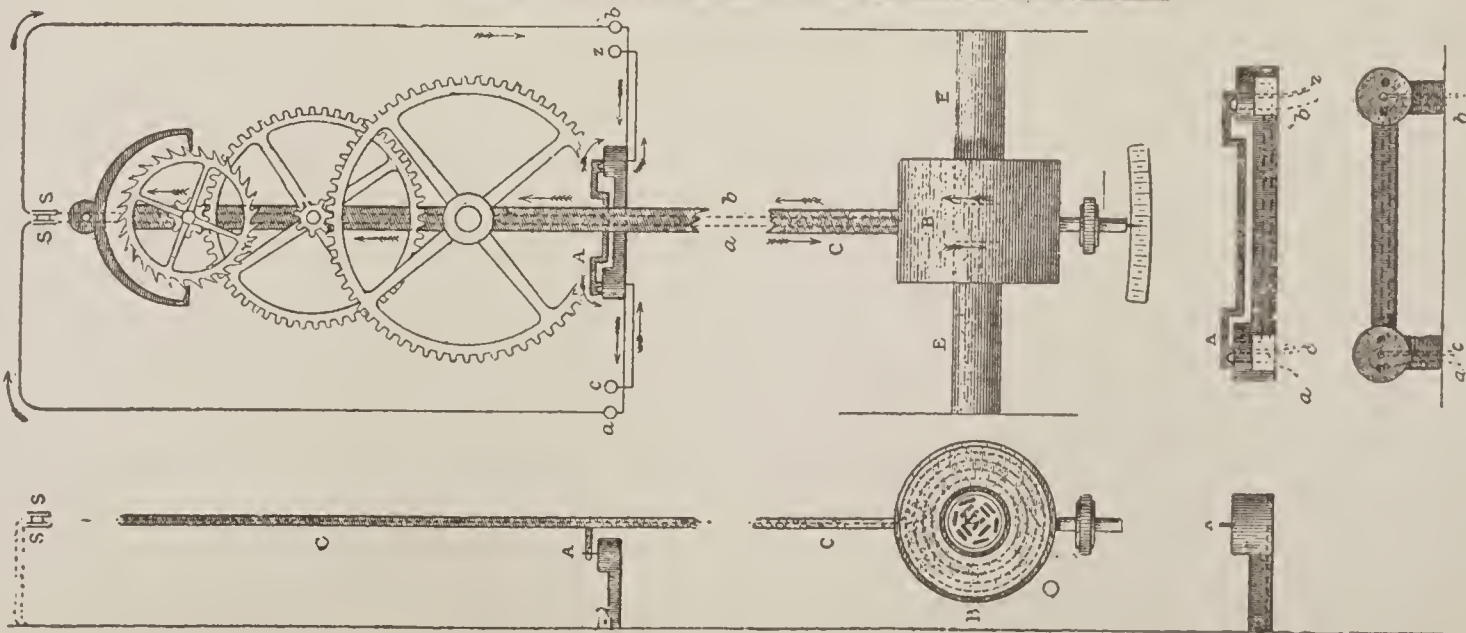
Water Clock



Sun Dial



Electric Clock



CLOCKS, HISTORICAL AND CELEBRATED

to be held on the axis *c*, by friction, thus admitting of its being turned at pleasure, while it is held by the axis so long as the hands are untouched. The minute hand is rigidly attached to its axis in order that it may be used as a hand in turning the wheel work of the two hands. Generally, but not always, the hour hand is held on its axis only by friction so that it can be turned around at pleasure without interfering with the other hand or with the going of the clock.

It is, of course, necessary to the correct going of a clock that the length of the pendulum should correspond to the number of the teeth in such a way that, as the pendulum goes through its natural vibrations, the wheels shall go according to the time of day. In the old-fashioned house clock, and in most good modern clocks, when it is desired to show seconds as well as hours and minutes, the pendulum takes one second to oscillate in each direction. It is then called a "seconds pendulum." There are then 30 teeth in the scape wheel, the latter turning through one sixtieth of the revolution as each alternate tooth escapes. The seconds pendulum is about $39\frac{1}{4}$ inches in length. (See PENDULUM.) It is not easy to move a clock about when the pendulum is so long. Hence, in ordinary clocks for household use either a balance wheel or a shorter pendulum is used. If the latter is one fourth the length of the seconds pendulum, it will vibrate in half a second. But, as clocks are constructed, the pendulum is not always made to vibrate in any simple fraction of a second. In this case, although a second hand may be put on the clock, and may go through its revolution in a minute, its motions will not beat seconds.

The rate of going of ordinary clocks varies with the temperature, the clock going faster the lower the temperature. In the case of the pendulum clock this is because the pendulum rod contracts with cold and expands with heat. If a balance wheel is used, not only does the balance contract with cold but the spring which moves it becomes stronger; so that for a double reason the clock goes faster in cold weather. Hence if accurate time is to be kept the pendulum or balance wheel must be compensated for changes of temperature. To show how this is done in the case of the balance wheel see CHRONOMETER. For the two methods of compensating a pendulum, see PENDULUM. Between the extremes of temperature to which the house clock is ordinarily subjected the differences of rate will only be about five or six seconds a day. As few people are able to regulate their clocks to this degree of precision it is only in very good clocks that compensation is attempted. The effect of heat and cold is much greater on the balance wheel than on the pendulum and may amount to half a minute or more a day.

The striking mechanism of the clock is brought about by a separate train of wheel work with its separate weight or spring, as shown in Fig. 2. There are two systems of making a clock strike the hour, one of which may be called the continuous system, and is used in clocks of American construction, while the other is mostly used in French clocks. The continuous system is one in which the striking goes on in its regular order, two always following one, three following two, and so on, no

matter how the hour hand may be situated. In this system if the clock begins striking wrong through running down or from any other cause it will continue to strike wrong until a proper adjustment is made. This is effected by touching a spring or pulling a wire in the clock, by which the striking mechanism is set in action and the clock made to strike around until it comes to the right hour. The French system is arranged with an eccentric cam on the axis of the hour wheel which stops the striking mechanism when the hammer of the clock has struck a number of strokes corresponding to the position of the hour hand. On this system the striking mechanism needs no adjustment to always strike correctly.

S. NEWCOMB.

Clocks, Historical and Celebrated. The most ancient form of clock was the clepsydra (q.v.) or water-clock. The clepsydra having been developed into a device with a dial and indicator operated by the current of water, the next improvement was the substitution of a weight for the water to operate the index. Archimedes is credited with this device. The necessity of some contrivance to regulate the descent of the weight led to the invention of the escapement and pendulum, a rude form of which is said to have been produced by Gerbert of Auvergne, afterward Pope under the name of Sylvester II., who died in 1003. In an old chronicle it is related that Charlemagne received a clock from Harun Alraschid in 809, to which small bells were attached, and in which figures of horsemen, at the hour of 12, came forth through doors and retired again. There is a more exact description of this work of art in the Franconian annals, attributed to Eginhard, in which it is particularly said to have been a clepsydra, and that at the end of each hour little balls of metal fell upon a bell and produced a sound. In the 12th century clocks were made use of in the monasteries, which announced the end of every hour by the sound of a bell put in motion by means of wheels. From this time forward the expression "the clock has struck" is often met with. The hand for marking the time is also made mention of. Of William, abbot of Hirschau, who died at the end of the 11th century, his biographer relates that he invented a horologium similar to the celestial hemisphere. Short as this account is, it still appears probable that this abbot was the inventor of clocks. In the 13th century there is again mention of a clock given by the Sultan Saladin to the Emperor Frederick II. This was probably put in motion by weights and wheels, as it marked the hours, the course of the sun, of the moon, and the planets in the zodiac. In the 14th century there are stronger traces of the present system of clock-work. Dante mentions clocks. Richard, abbot of St. Albans, made a clock in 1326, which indicated the course of the sun and moon, as well as the ebb and flow of the tide. Large clocks on steeples were first made use of in the 14th century. In 1340 a monk named Peter Lightfoot made for Glastonbury Abbey a clock with an escapement and regulator for securing equable motion. At the time of the Reformation it was removed to Wells Cathedral, where part of it still remains. In 1835, the mechanism being entirely worn out, the clock was supplied with new works and the

CLOCK AND WATCH INDUSTRY — CLÆLIA

dial somewhat remodeled, and a minute circle and index added. At the base of the arched pediment which surmounts the square of the dial is an octagonal projection from which rises a panelled turret. Around this, fixed to two rings of wood, are sets of horsemen which formerly revolved in opposite directions as the hour was struck.

Of all horological machines, the successive clocks at Strasburg Cathedral have perhaps attracted the most attention as mechanical curiosities. These have been three in number. The first was constructed about 1352, the second in the latter part of the 16th century. Early in the 19th century it was evident that reconstruction was necessary, and this was ultimately entrusted to Charles Schwilgue, who entered on his task in 1838 and completed it about the middle of 1842. On the 2d of October of that year the new life of the resuscitated marvel was solemnly inaugurated. On the floor level is a celestial globe indicating sidereal time, and the rising, setting, and passage over the meridian of Strasburg of all stars visible with the naked eye. Behind this is a calendar showing months, days of the month, dominical letters, and all feast days. Above the calendar is a gallery with allegorical figures representing the days of the week (Sunday, Apollo drawn in a chariot by horses; Monday, Diana drawn by a stag; Tuesday, Mars; Wednesday, Mercury; Thursday, Jupiter; Friday, Venus; Saturday, Saturn), which pass in order from left to right. Above this is a dial for showing ordinary time, a planetarium, and a globe showing phases of the moon. Next come movable figures representing the four ages of man, which strike the second stroke of each quarter on a bell. A genius seated beside the ordinary dial strikes the first note of each quarter with a sceptre; the genius on the opposite side turns an hour-glass at each hour. Death strikes the hour with a bone. Above, a procession of the 12 Apostles passes at noon before Christ, bowing at his feet, while he makes the sign of the cross. During the procession a cock perched on the top of the left-hand turret flaps its wings, ruffles its neck, and crows three times.

A clock at Berne, which dates from 1527, presents some curious features. Three minutes before the hour a wooden cock crows and claps its wings; in another minute a procession of bears (baren, referring to the name "Berne") passes around a seated figure of a bearded old man; the cock (above the arch, and to its right) then crows again. The hour is struck on a bell at the top of the tower, by a foll with a hammer, and at each stroke, the bearded figure raises his sceptre and opens his mouth, while he turns an hour-glass; a bear inclines his head at the same time. Then the cock crows again.

Another celebrated clock is at Venice, dating back to the 17th century. It has a dial of blue and gold, and is surmounted by bronze figures which strike the hours upon a bell. On Ascension Day, and for 14 days after, figures of the Magi come forth in procession and salute the Virgin and Child (as shown above dial) when the clock strikes 12.

Yet another is the clock of the English Houses of Parliament at Westminster. It was designed by Lord Grimthorpe (then Mr. E. B. Denison) and was first set going in 1860. The tower is

320 feet high, and the dials are 180 feet from the ground. Each of them is 22½ feet diameter, of opalescent glass set in an iron framework. The hour figures are two feet long and the minute spaces one foot square. The works contain three trains — one drives the hands, another the mechanism for striking the hours, the third the chimes. The pendulum is fully 13 feet long and weighs nearly 700 pounds. The going part of the clock requires winding once a week, the striking parts twice. The hour bell weighs 13 tons, the quarter bells collectively eight tons. Though there are clocks with larger dials, this clock is probably the most powerful as well as the most accurate of all large time-keepers. It cost more than \$110,000.

Clock and Watch Industry. See WATCH-MAKING, MODERN.

Clodd, Edward, English writer: b. Margate, Kent, 1 July 1840. He entered commercial life in 1860 and has been secretary of the London Joint Stock Bank from 1872. He is the author of 'The Childhood of the World' (1872); 'The Childhood of Religions' (1875); 'Jesus of Nazareth' (1880); 'Myths and Dreams' (1885); 'Story of Creation' (1888); 'Story of Primitive Man' (1895); 'Primer of Evolution' (1895); 'Pioneers of Evolution' (1897); 'Grant Allen' (1900); 'Story of the Alphabet' (1900); 'Thomas Henry Huxley' (1902).

Clodia, one of the three sisters of Publius Clodius Pulcher. She was married about 60 B.C. to Quintus Metellus Celer, who died the following year, probably from poison. Cicero having rejected her advances, she conceived a mortal hatred against him, and, in concert with her brother, used every possible means to effect his ruin. On her accusing Cælius Rufus of an attempt to poison her, Cicero undertook his defense, and depicted her dissolute life in a speech which is still extant.

Clodius Pulcher, klō'dī-ŭs pŭl'kēr, **Publius**, Roman politician. He was the son of Appius Claudius Pulcher, who was consul about 79 B.C. In the third Mithridatic war he served, with his brother, Appius, under Lucullus. He then served under his brother-in-law, Quintus Marcius Rex, proconsul of Cilicia; was given the command of the fleet and fell into the hands of pirates, but obtained his liberty. He returned to Rome about 65 B.C., and in the following year accompanied the proprætor, Lucius Muræna, to Gaul, where he enriched himself by the most scandalous means. He is said, though apparently on insufficient ground, to have been implicated in Catiline's conspiracy, and continued to be a ringleader in almost all the seditions of the time, till he became a candidate for the prætorship, opposing Titus Annius Milo, and was killed in an encounter with Milo. The celebrated speech of Cicero in defense of Milo has saved the name of Clodius from oblivion.

Clœlia, klē'lī-ā, a girl of Rome, who, the legends say, having been given up to Porsena as a hostage, escaped to Rome by swimming the Tiber. The Romans, however, to keep faith with Porsena, sent her back to him. Porsena would not retain her, but, as a reward for the generosity of the Romans, freed her and her fellow hostages, and also gave her several of the Etrurian youths for her service.

CLOG-ALMANAC — CLOOTS

Clog-almanac, an almanac or calendar made by cutting notches or characters on a clog or block, generally of wood. The block had generally four sides, three months for each edge. The number of days is marked by notches, while various symbols are used to denote saints' days, the golden number, etc.

Cloisonne, in ceramics, a method of enameling, applies for the most part to metal, since the effects are more easily attained thus than when it is applied to porcelain; specimens of the latter sort being, indeed, chiefly regarded as curiosities. In cloisonné work (so-called from *cloison*, a partition), fine metallic walls of the same material as the basis (for example, copper) are soldered by a strong cement by one edge to the basis; and these walls in this manner form numerous cells or compartments, in which the vitrifiable enamel pastes of various colors are placed. The enamel is then vitrified by several firings—three or four generally being required before enough enamel can be applied to afford an approximately level surface—and subsequently is ground and polished to a high degree. The Gauls in Roman times and previously made cloisonné, and it was employed for decorative purposes in shrines, altar-pieces, and church plate in the Middle Ages. It has not since been used until recent experiments were attempted. The Oriental cloisonnés are well known, particularly the Japanese. The art is said to have been introduced into Japan from China in the 16th century of the Christian era. Japanese cloisonné is made chiefly at Owari, Kioto, Tokio, and Osaka. In later specimens of the Japanese work the partitions are reduced to a minimum, apparently making no separation between the color masses of the enamel. The finest examples of the Oriental cloisonnés display great brilliancy.

Cloister (O. F. *cloistre*, Lat. *claustrum*, bar, enclosed place), a court enclosed by covered walks. The latter are, strictly speaking, the cloisters, the central space being termed the cloister garth. The walks, or ambulatories, are open on the side toward the garth and when appertaining to monastic or collegiate establishments were intended for the use of monks or nuns or the clergy attached to the Church. The cloisters are usually, though not invariably, placed on the south side of the church. They are commonly square on the plan, having a plain wall on one side, a series of windows between the piers or columns on the opposite side, and covered with a vaulted or ribbed ceiling. They form part of the passage of communication from the church to the chapter-house, refectory, and other parts of the establishment. The chapter-house usually opens from the east walk, the refectory and certain other domestic buildings of a monastic house, from the south walk.

Cloister and the Hearth, The, a novel by Charles Reade, published 1861. The masterpiece of this vigorous novelist recreates the 15th century, and presents to modern eyes the Holland, Germany, France, and Italy of the Middle Ages, as they appeared to mediæval people. The dramatic quality of the story, its vivid descriptive passages, the force and individuality impressed on its dialogue, its virile conception of the picturesque brutality and the lofty spirituality of the age it deals with, the unfailing brilliancy of the novelist's treatment of his theme,

and its humorous quaintness, place 'The Cloister and the Hearth' among the great historical romances of the world.

Clonmel, klön'měl, Ireland (Gælic, that is, "Vale of Honey"), a municipal borough situated on both sides of the Suir; part in Tipperary and a small part in Waterford; and 90 miles southwest of Dublin. Three stone bridges cross the Suir and connect the parts of the town; it has good streets, well paved and well lighted. Clonmel was founded by the Danes, and has long been noted for its love of learning. The fame of the schools established by the Franciscans in the 13th century extended to all the seats of learning on the Continent. The chief edifices now in the town are an Episcopal church, two Roman Catholic churches, a Franciscan abbey, the court-house, jail, barracks, free library, town-hall, convents, schools, lunatic asylum, etc. The trade is chiefly in grain, cattle and provisions; and there are flour-mills, creameries, a brewery, etc.

Laurence Sterne, the novelist, was born in Clonmel, and Lady Blessington, the writer, was born near by. Pop. 8,500.

Clontarf, klön'tärf, Ireland, a town in county Dublin, on the northern shore of Dublin Bay, some three miles northeast of Dublin. It is a much frequented watering-place, and is historically interesting as the scene of Brian Boróimhe's victory over the Danes in 1014. Pop. 5,200.

Cloots, Jean Baptiste von, zhöñ báp tēst fōñ klōts, Prussian baron, well known during the Revolutionary scenes in France under the appellation of Anacharsis Cloots; d. 24 March 1794. He was born at Cleves in 1755, and became possessed of a considerable fortune, which he partly dissipated through misconduct. He traveled in different parts of Europe, and formed an acquaintance with many eminent individuals, among whom was the celebrated Edmund Burke. The first work in which he distinguished himself was the ridiculous masquerade called the 'Embassy of the Human Race,' partly contrived by the Duke de Liancourt. On the 19th of June 1790, Cloots presented himself at the bar of the national assembly, accompanied by a considerable number of enthusiastic followers of various nationalities, English, German, Italian, Spanish, and others. He described himself as the orator of the human race, and demanded the right of confederation, which was granted him. At the bar of the assembly, 21 April 1792, he made a strange speech, in which he recommended a declaration of war against the king of Hungary and Bohemia, proposed that the assembly should form itself into a diet during a year, and finished by offering a patriotic gift of 12,000 livres. On the 12th of August he went to congratulate the legislative assembly on the occurrences of the preceding 10th, and offered to raise a Prussian legion, to be called the Vandal Legion. The 27th of the same month he advised the assembly to set a price on the heads of the king of Prussia and the Duke of Brunswick, praised the action of John J. Ankarström, the assassin of the king of Sweden, and, among other absurd expressions, he said, "My heart is French and my soul is sansculotte." He displayed no less hatred to Christianity than to royalty. In September 1792 he was nominated deputy from the department of the Oise to the national conven-

CLOSE TIME — CLOTHING

tion,* in which he voted for the death of Louis XVI. "in the name of the human race." He became an object of suspicion to Robespierre and his party, was arrested and condemned to death.

Close Time, a period of the year during which certain animals are protected by law, and are not allowed to be caught or killed. Such animals are chiefly those that are killed for food or sport, and include birds, fishes, and quadrupeds, as well as certain others — crabs, lobsters, and oysters, for example.

Clo'sure (often needlessly *clôture*, the same word in French), the European substitute for the American "previous question": the power of shutting off debate when the speaker or the majority think it has exhausted legitimate argument and is used for mere obstruction. As the equity of neither deciding power can be guaranteed, it is also a possible weapon of mere "gag-law"; but it has shown itself to be the only method in which parliamentary institutions can be worked. In Congress the "previous question" exists in the House, but not in the Senate, and this possibility of indefinite blocking of public interests by a single unscrupulous member, has caused an active movement for introducing it into the Senate also. In the British Parliament no such rule existed till 1882, debate being unlimited; and the fairness of its members, and their unity of feeling as Englishmen, had prevented any serious ill results. But about 1872 Isaac Butt, the leader of the Irish Home Rule party, began the policy, carried on after his death by Parnell, of putting a stop to all legislation on English subjects until all Irish demands had been granted, by talking against time, making irrelevant motions, calling for divisions on every motion, etc. For many years Parliament struggled under this, extremely loath to tie down the immemorial freedom of debate, but was finally forced to act, and in 1882 passed a "closure" rule, which allowed the speaker, on request of 40 members, to pronounce debate closed and call for a vote. In 1887 this was modified to require the petition of 200 members, or of only 100 in case the negative vote is less than 40. The French *clôture* dates from Louis Napoleon's accession in 1851.

Clotaire (klō-tār) I., son and successor of Clovis (q.v.), first king of the Franks in Gaul, reigned as sole king from 558 to 561. CLOTAIRE II., a king of the same Merovingian dynasty, reigned over the Franks 30 years later.

Cloth. See WEAVING.

Cloth of Gold, Field of the. See FIELD OF THE CLOTH OF GOLD.

Clothes-moth, a moth (*Tinea pellionella*), of the family *Tineidæ*, in which the wings are long and narrow, pointed at the end, and with a long finger. It is pale buff-yellow, with no definite markings. It may be seen flying about the house the last of May, or still earlier if the weather be warm, when it lays its eggs in woollens. The young caterpillar is whitish, and begins, on hatching, to construct a flattened cylindrical case in which it lives, dragging the case about with it. The mischief is done by the worm, the caterpillar working through the next 10 months, finally changing to a pupa in its case, and the best preventative is cold storage at a temperature of 40° F., or the use of naphthaliun or camphor. Woolen garments should be care-

fully brushed and put away in cotton sacks or in camphor trunks, or wrapped tightly in stout paper, or stored in large pasteboard boxes rendered tight by gumming a strip of wrapping paper around the edge, so as to seal the box completely. Consult: Packard, 'Guide to the Study of Insects'; Howard and Marlatt, 'The Principal Household Insects of the United States'; 'Bulletin 4 of the United States Department of Agriculture.'

Clothing, the artificial coverings worn by human beings for protection against the weather and from motives of decency. Nothing is more necessary to a comfortable state of existence than that the body should be kept in a nearly uniform temperature. The skin, by increase of the perspiration, carries off the excess of heat; the lungs, by decomposing the atmosphere, supply the loss; so that the internal parts of the body are preserved at a temperature of about 98° under all circumstances. In addition to the important share which the function of perspiration has in regulating the heat of the body, it serves the further purpose of an outlet to the constitution, by which it gets rid of matters that are no longer useful in its economy. The excretory function of the skin is of paramount importance to health, for if the matters that ought to be thrown out of the body by the pores of the skin are retained, they invariably prove injurious. When speaking of the excrementitious matter of the skin the sensible moisture which is poured out in hot weather, or when the body is heated by exercise, is not meant; but a matter which is too subtle for the senses to take cognizance of, which is continually passing off from every part of the body, and which has been called insensible perspiration. This insensible perspiration is the true excretion of the skin. A suppression of the insensible perspiration is a prevailing symptom in almost all diseases. It is the sole cause of many fevers. Very many chronic diseases have no other cause. In warm weather, and particularly in hot climates, the functions of the skin being prodigiously increased, all the consequences of interrupting them are proportionably dangerous. Besides the function of perspiration, the skin is an organ of absorption. It is also the part on which the organ of feeling or touch is distributed. The skin is supplied with glands which provide an oily matter that renders it almost impervious to water, and thus secures the evaporation of the sensible perspiration. Were this oily matter deficient, the skin would become sodden, as is the case when it has been removed — a fact to be observed in the hands of washerwomen, when it is destroyed by the solvent powers of the soap. The hair serves as so many capillary tubes to conduct the perspired fluid from the skin. The three powers of the skin, perspiration, absorption, and feeling, are so dependent on each other that it is impossible for one to be deranged without the other two being also disordered. For if a man be exposed to a frosty atmosphere till his limbs become stiff and his skin insensible, the vessels that excite the perspiration and the absorbent vessels partake of the torpor that has seized on the nerves of feeling; nor will they regain their lost activity till the sensibility be completely restored. The danger of suddenly attempting to restore sensibility to frozen parts is well known. If the addition of warmth be not

CLOTHING AND FURNISHING TRADE

very gradual, the vitality of the part will be destroyed. This consideration of the functions of the skin will at once point out the necessity of an especial attention, in a fickle climate, to the subject of clothing. The chief end proposed by clothing ought to be protection from the cold; and it never can be too deeply impressed on the mind (especially of those who have the care of children), that a degree of cold amounting to shivering cannot be felt without injury to the health, and that the strongest constitution cannot resist the benumbing influence of a sensation of cold constantly present, even though it be so moderate as not to occasion immediate complaint, or to induce the sufferer to seek protection from it. This degree of cold often lays the foundation of the whole host of chronic diseases, foremost among others which are found scrofula and consumption. Persons engaged in sedentary employments must be almost constantly under the influence of this degree of cold, unless the apartment in which they work is heated to a degree that subjects them, on leaving it, to all the dangers of a sudden transition, as it were, from summer to winter. The inactivity to which such persons are condemned, by weakening the body, renders it incapable of maintaining the degree of warmth necessary to comfort without additional clothing or fire. Under such circumstances a sufficient quantity of clothing of a proper quality, with the apartment moderately warmed and well ventilated, ought to be preferred to any means of heating the air of the room so much as to render any increase of clothing unnecessary. To heat the air of an apartment much above the ordinary temperature of the atmosphere, we must shut out the external air; that of the close room becomes extremely rarefied and dry; which circumstances make it doubly dangerous to pass from it to the cold, raw, external air. But in leaving a moderately well warmed room, if properly clothed, the change is not felt.

The only kind of dress that can afford the protection required by the changes of temperature to which high northern climates are liable is woolen. Those who would receive the advantage which the wearing of woolen is capable of affording must wear it next the skin; for it is in this situation only that its health-preserving power can be felt. The great advantages of woolen cloth are briefly these: The readiness with which it allows the escape of sweat through its texture; its power of preserving the sensation of warmth to the skin under all circumstances; the slowness with which it conducts heat; the softness, lightness, and pliancy of its texture. Cotton cloth, though it differs but little from linen, approaches nearer to the nature of woolen, and on that account must be esteemed as the next best substance of which clothing may be made. Silk is the next in point of excellence, but it is very inferior to cotton in every respect. Linen possesses the contrary of most of the properties enumerated as excellencies in woolen. It retains the matter of perspiration in its texture, and speedily becomes imbued with it; it gives an unpleasant sensation of cold to the skin; it is very readily saturated with moisture, and it conducts heat too rapidly.

There are several prevailing errors in the mode of adapting clothes to the figure of the body, particularly among women. Clothes should be so made as to allow the body the full exer-

cise of all its motions. The neglect of this precaution is productive of more mischief than is generally believed. The misery and suffering arising from it begin while the child is yet in the cradle. Girls have for a while the same chance as boys, in a freedom from bandages of all kinds; but as they approach womanhood they are subjected to trammels in the form of stays. The bad consequences are not immediately obvious, but not the less certain on that account. The girl writhes and twists to avoid the pinching which must necessarily attend the commencement of wearing stays tightly laced. The posture in which she finds ease is the one in which she will constantly be, until at last she will not be comfortable in any other, even when she is freed from the pressure that originally obliged her to adopt it. In this way most of the deformities to which young people are subject originate, and, unfortunately, it is not often that they are perceived until they have become considerable, and have existed too long to admit of remedy.

Clothing and Furnishing Trade. Much as the modern clothing manufacturer would delight to honor the memory of the man who first conceived the idea of making ready-to-wear clothes, search as he may the records of the past, there is nothing to indicate his name or habitation. In fact, so utterly recordless are the early days of the trade that everything in any way relating to its origin may be said to have been lost in the obscurity of time, and yet, strangely enough, it was not more than three-quarters of a century ago that such an article as a ready-made garment was unknown in America. In view of the comparatively recent origin of the trade, therefore, it is somewhat remarkable that nobody should be able to furnish any information about the beginning of an industry that is now one of the great sources of income in the United States.

Of course, there is a tradition which specifies that the first attempt to make ready-to-wear clothing was made at New Bedford, Mass., where the sailors, whether returning from their whaling trips or bound for new adventures on the sea, were most unwilling to wait for the slow process of the shears and the goose. To supply these immediate and pressing needs, it is said, one of the dealers who controlled a large part of the custom of the men from the ships, made up a few garments from the coarsest material, and for these he secured such good prices from the impatient seamen when they called at his shop that other merchants who dealt in such clothing were quick to see the wisdom of his course and, accordingly, followed his example.

Whether this tradition is true to fact or not, it is generally admitted that the industry of making ready-made clothing owes its origin to some such emergency. When the idea reached Boston, about 1830, its practicability had already been proved in some other place, so, for want of better information, it is not at all improbable that the Yankee genius who first devised this method of meeting the demands of his impetuous customers lived in New Bedford, and that he was the person who unconsciously laid the foundation for the great industry which was to have such a stupendous influence upon the commercial history of the nation.

Prior to the first quarter of the 19th century every man who desired to purchase a new suit of clothing was obliged to go to his draper for

CLOTHING AND FURNISHING TRADE

such raiment. He was there measured, much as he would be measured for custom-made garments to-day, but as every stitch of the work was necessarily performed by hand — the sewing machine not having been invented — the process was a slow one.

This lack of labor-saving machinery was one of the factors which tended to retard the development of this new branch of the clothing trade. It was taken up in Boston, and, a few months later, was adopted by New York clothiers, but it was not until some years had passed and the Metropolitan merchants were compelled to meet the eager demands of those who were impatient to emigrate to the newly-discovered goldfields in California, that the trade in such clothing was greatly stimulated. In the South and West, however, and especially in those sections that were most remote from the commercial centres, the demand for such garments was greatest, and as people, even in the East, began to find that ready-made clothes were more economical as well as more convenient to purchase, the clothiers found it necessary to open small factories in which it might be possible for them to fill their orders more systematically.

The history of the wholesale production of ready-made clothing began about 1831, when George Updyke, once mayor of New York city, opened a factory for the manufacture of clothing in Hudson street. He had a store in New York and one in New Orleans. About 1834, John D. Scott, Updyke's brother-in-law, removed to New York from New Jersey to assume charge over this factory, the firm name then being changed to John D. Scott & Co. Finding that they could trade profitably with the South, they soon opened other branches in Memphis and Charleston, and business was carried on in all of these stores until 1865, when, owing to the death of Scott, the firm was dissolved. Large and lucrative as their business had been, however, their product consisted chiefly of the coarsest kind of garments. They supplied the planters with some good clothes, but the bulk of the material they manufactured was intended for the use of the negro field hands.

It is quite natural that the success attained by Updyke, and afterward by Scott, should have inspired other clothingmen to follow their example. John T. Martin, from whom, through a variety of changes, has come the present house of Rogers, Peet & Co., went to Saint Louis long before the war, and there he amassed a large fortune by supplying the South and West with the cheap clothing which those sections required. Thomas Chatterton, who began his business career as a clothing dealer, finally entered the manufacturing field, and, in 1856, he established a large factory at 60 Liberty street, New York. A few years later he removed to Warren street and the firm name was changed to Lewis, Chatterton & Co. Brooks Brothers began business about 1845. As they intended to cater quite extensively to the trade of the sailors who always congregated about the water front, they located their first shop at the corner of Catherine and Cherry streets. The firm of Browning, King & Co. was started by William C. Browning, in 1858. Prior to that time Browning had been employed as manager of the clothing department of the store owned by his father, John H. Browning. In 1858 he secured a partner in the

person of John E. Hanford, formerly of Lewis & Hanford, a firm that had been engaged in the manufacture of clothing for the South and West. The new house entered the same field and was extremely prosperous until the outbreak of the war, when their loss amounted to fully \$500,000. Soon after war was declared, however, they entered into a contract with the Federal government to furnish the soldiers with clothing to the amount of \$1,200,000, and, although the firm of Hanford & Browning was dissolved in 1862, the business was continued under the name of Browning, Button & Kimball. This was afterward changed to William C. Browning & Co., and, finally, to Browning, King & Co., under which name the firm now conducts stores in 15 cities, in addition to its wholesale-house in Chicago, and its factory in New York.

Among the other ante-bellum clothiers, some of whom are still in business, but most of whom have long since retired from this commercial field, were Lewis B. Brown & Co., A. T. Bruce & Co., H. & J. Paret, C. J. Longstreet & Co., Archibald Young & Co., Garrett, Young & Co., and Little, Pyan & Carhart, afterward successively Schaeffer, Whitford & Co., Carhart, Whitford & Co., and, as at the present time, Hackett, Carhart & Co.

The advent of the Civil War was a crucial period in the history of the clothing trade. Nearly all the large manufacturers had been dealing largely with the South and West. Those whose trade was mainly with the Southern States accordingly lost heavily, so heavily that several of the firms went to the wall, while others who had a well-established line of customers throughout the West and North benefited greatly by the sudden demand for clothing that followed the declaration of hostilities. Many manufacturers, like John T. Martin and Hanford & Browning, secured large contracts for making uniforms for the government troops. As the small factories which were then in operation were quite unable to fill such enormous orders, this clothing was at first made in the homes of the workmen, but, afterward, the demands upon the producers continuing to increase, larger factories were established and the requisite help was employed. Naturally this was a great stimulus to the clothing trade, and yet the period was by no means a bright one for the manufacturer. Thus, while the government was reasonably prompt in payment, such payments were made in certificates and as these were subject to depreciation, the business of filling these contracts was not without its hazards. Of course, there were few Northern dealers who did not possess strong faith in the stability of the government, and the most prominent manufacturers, having sufficient capital to enable them to weather the financially stormy days of the war, received their reward when, by the re-establishment of the national credit, their certificates went once more to par. Moreover, busy as these manufacturers had been during the war times, peace was followed by still greater activities in the clothing trade. Returning home, the soldiers required new clothing and the demand was so pressing that it was absolutely impossible to supply it. It is safe to say that millions of dollars were spent for clothes and other articles of men's furnishings during the first 12 months that followed the close of the war.

In reviewing the history of the clothing trade

CLOTHING AND FURNISHING TRADE

during this period of its development it is interesting to remember that such a demand for cheap clothes could never have been filled if it had not been for the invention of a machine which greatly increased the powers of production. This was the sewing machine, which was introduced to the clothing trade about 1850. Prior to the perfection of this invention the clothing manufacturers had been unable to produce their goods with sufficient rapidity to meet even the ordinary demands that were made upon them. To offset this difficulty huge bundles of garments were sent to the country towns in the neighborhood of New York, Boston, and Philadelphia, where they were sewed by the wives and daughters of the farmers, most of whom were glad of an opportunity to obtain such means of employment during the long months of the winter. As they were chiefly unskilled laborers, however, their work was performed so roughly that it could be used only to supply the cheaper class of trade, and all neat work was necessarily retained in the cities, where it could be finished by experts in the use of the needle. Under such circumstances it is not difficult to realize with what delight the sewing machine was hailed. Promising as it had seemed, however, it was not, in the beginning, entirely satisfactory. It was found that the machine-stitching ripped and that it was by no means as firm as the hand-sewed product, but when the lock-stitch came, and it was not long before this improvement was perfected, the principal fault was remedied. From that day, therefore, the machine was used by every maker of such clothing, and, without this aid, it would have been utterly impossible to have produced the garments required by the government during the four years of the war.

Another improvement which came about 1870, was the introduction of the cutting machine in the wholesale manufacture of clothing. In the old days nothing but the heavy old-fashioned shears had been used, but they had been superseded by a long knife, especially in the factories. With this knife, which operated something like a saw, it was possible to cut as many as 18 thicknesses of cloth at one operation, whereas, in the use of the shears, a single thickness only could be cut. For many years this was regarded as the best possible method of cutting clothing, for the Fenno and Worth cutting-machine did not appear until fully 1870.

This invention, which has helped so much to revolutionize the clothing industry in the United States, consisted of a circular disk, which, as it revolved with great rapidity, was capable of cutting as many as 24 thicknesses of cloth with the speed of the buzz-saw and an accuracy that could not be duplicated by any human agency. By the use of such inventions it is now possible to cut and sew hundreds of suits of clothing in less time than was formerly required by the draper for his work of fashioning a single garment. Among all the methods used in olden times the only one which is still in general use is the ancient goose, for nobody has yet found it possible to suggest any improvement in its form, although, in many instances, electricity has taken the place of the old-fashioned furnace as a means of heating it.

Of course, with such an ever-increasing demand for ready-made clothing, the manufacturers were compelled to devise some system

by which their garments might be produced more expeditiously. The result was a concentration of effort by a new division of labor. For example, whereas the work of making of a whole suit was formerly left to a single tailor, under the new system many hands were employed in constructing one garment. Thus, leaving the hands of the designer, whose position is a most responsible one, the garment passes into the hands of the cutter, who deftly attends to his portion of the work. From his hands it goes to those who are to sew it, the persons who sew only certain parts of each particular garment. There are also vestmakers, "hands-on-pants," as the technical phrase has it, then to others who sew on buttons, and to those who make button-holes, a difficult operation which is now largely performed by machinery.

It was many years after the inauguration of the ready-made clothing industry that manufacturers began to make ready-to-wear clothes for boys, and this branch of the trade has continued to be developed separately and along its own lines. It was the firm of Smith & Davidson that first decided to devote their attention to the making of children's garments. This was about 1860. During war times the firm was known as Peck, Randolph & Co., and, in 1865, Smith removed to Williamsburg, where he established the present house of Smith, Gray & Co. Among other pioneer houses which were prominently interested in the manufacture of clothing for boys, one must not fail to mention the firms of W. T. Runk & Co., now represented by their legitimate successors, Hippel, Tillard & Runk; Dayton & Gilman, a house now known as Dayton & Close; William Banks & Co., and Barrett & Schaeffer. Of course, prior to the days of the factory product all children's clothing had been made at the homes of the dressmakers who had contracted for such work.

To say that the United States is the land of ready-made clothing is in no sense intended as a disparaging remark. The day has passed when men can feel that "hand-me-downs," as such garments were formerly known, stamp the wearer as parsimonious or vulgar. In the early days of the trade there may have been some ground for the prejudice that was so generally felt in regard to "slop clothes," but as the methods of manufacture improved and the demand for a better grade of goods increased, the American factories began to make a product that was in no sense inferior, either in style or material, to the best work of the merchant tailors. In the early days, cheap clothing may sometime have meant "slop" clothing, but when men realized that it was only necessary for them to pay a little higher price to secure the best quality of goods the wonderful advance in the character of factory-made clothing commenced. Since that point was finally settled, some years after the war, there has been no cessation in the development of the trade, and, to-day, it is safe to say, not only that nine-tenths of the men and boys of this country are attired in ready-made garments, but that the majority of them are clothed as neatly and as well as the one-tenth who still persist in patronizing the custom tailor.

Statistics of this trade are not easily obtained, and yet, in view of the conditions which have so long existed, it is not surprising that the figures that are accessible should show that the growth of this industry has been something

CLOTHO

stupendous, especially since the advent of that period of activity which followed the outbreak of the Civil War. In 1860, therefore, New York had 303 clothing manufacturers, while Philadelphia had 352 such factories. The total output of these 655 factories amounted to about \$27,000,000, of which sum New York was credited with more than \$17,000,000. So far as the entire country was concerned the total product for that year was less than \$81,000,000. According to the latest census reports, in 1900, the manufactures of woolen goods and worsteds in the United States amounted to \$238,744,502, while, in addition to this, the cotton and silk manufactures were respectively \$339,200,320 and \$107,256,258. As it is safe to say that about three-quarters of the woolen cloth as well as a large portion of the cotton and silk produced in the United States is used by the makers of ready-made clothes it is not difficult to see how much influence the clothing manufacturer must have upon manufacturing interests in general. The following table, prepared from the latest reports of the United States census, presents a clear and compact view of the extent and development of the clothing industry during the latter half of the 19th century. In comparing these years, however, it must not be forgotten that the figures for 1850 include both the clothing and tailoring trades. The statement is as follows:

PRODUCTION OF MEN'S GARMENTS.

Year	Capital	Wages	Materials	Products
1850.....	\$12,509,161	\$15,032,340	\$25,730,258	\$48,311,709
1860.....	27,246,093	19,856,426	44,149,752	80,830,555
1870.....	50,223,380	30,746,579	86,794,706	148,660,253
1880.....	70,861,696	45,947,353	131,363,282	209,548,460
1890.....	128,253,547	51,075,837	128,846,857	251,019,609
1900.....	120,620,351	45,505,778	145,297,248	276,861,607

The history of the men's furnishing trade dates from 1832, when the firm of David & Isaac N. Judson, then one of the most prosperous men's clothing-houses in New York city, began the manufacture of custom shirts as a systematic industry. For several years this firm had been active in catering to the demands of the South, and when, as often occurred, the order for clothing was accompanied by one for "shirts," the commission was entrusted to such casual seamstresses as might be under contract to supply this kind of work. As time passed, however, and such orders continued to increase in number, the idea of manufacturing "stock" shirts suggested itself, and, accordingly, in 1832, this house opened the first shirt factory in America at the corner of Cherry and Market streets, New York.

For about eight years the Judsons had everything their own way, but, in 1840, the firm of Luke Davies & Son, which had been engaged in the sale of so-called men's wares since 1822, also opened a shirt factory. In fact, while Davies has long been known as the "father" of the trade, he quite as well deserves the title of god-father, for he it was who gave to it the name which it has since borne, that of "furnishing goods." For many years his firm was one of the most prosperous houses in the city. Originally importers, for nearly everything that a man required in matter of dress was then imported, they later branched out into many kinds of manufacturing enterprises which gave them

such a wide influence in the trade that there are few of the long-established houses that do not owe their existence, in some way or other, to the firm of Luke Davies & Son, or their successors, Robert K. Davies & Co., who continued the business until 1890, when their long record of commercial success ended in failure.

It was from the Davies house that Joseph S. Lowrey went, in 1857, to establish the firm of Lowrey, Donaldson & Co. Ten years later it changed its name to that of Joseph S. Lowrey & Co., under which title it is still conducting business. Fisk and Flagg also left Davies when they started the firm of Fisk, Clark & Flagg, and as nearly all the large firms which now control the various branches of the men's furnishing goods industry can trace their descent from one of these concerns, those who are well informed regarding the history of the business usually refer to the elder Davies as the "father" of the trade.

Although nearly all the great improvements, and certainly the most marked developments in the men's furnishing goods industry, have dated from the latter part of the 19th century, the period between 1840 and 1860 was an important one in the history of the trade, for it was during this decade that the American dealers ceased to be importers and became their own manufacturers. From the earliest days of the colonies the American market for men's wear had been supplied from abroad. Custom shirts were practically the only exceptions to this rule, and many of these were made to order in England. Finally, however, a dry-goods dealer named Brown began to make collars — "string collars" they were called in those days, because they were worn with the old-fashioned stock tie — and, within a comparatively few years many other merchants were following his example.

From this beginning came the collar factories; a little later, the making of cuffs, then other necessities, like neckwear, suspenders, underwear, hosiery, and, finally, all the hundred and one inventions which the well-dressed man of this day requires to perfect his toilet. During the past decade, however, the manufacture of each of these articles has become a distinct industry, each of which has required the invention of special labor-saving machinery just as it has demanded its specially skilled workmen.

Some idea of the extent of the furnishing goods trade may be obtained from the fact that, in 1900, there were 470 establishments engaged in this business, and while the invested capital represented more than \$20,000,000, the value of their annual product was nearly \$44,000,000. In addition to this there were nearly 1,000 hosiery manufacturers, with a product of more than \$95,000,000, much of which represented their output of men's hosiery, and the shirt manufacturers, with their 1,000 factories, and their product of \$50,000,000, to say nothing of the countless other makers of men's specialties whose reports are scattered through the several volumes in which the progress of American industries up to the beginning of the 20th century has been recorded by the Census Bureau.

Clotho, one of the three Fates or Destinies who are represented by the ancient classical writers as spinning the thread of life. Clotho held the distaff, Lachesis spun the thread which Atropos cut when the span of life was reached.

CLOTILDA — CLOUDS

In zoology, *Clotho* is a genus of snakes of the tribe *Viperina*, family *Viperidae*. *C. arietans* is the puff-adder of the Cape of Good Hope. In astronomy, *Clotho*, is the name of the 97th asteroid, discovered by Tempel 17 Feb. 1868.

Clotil'da, St., the daughter of Chilperic, king of Burgundy: b. 475; d. Tours 545. In 493 she became the wife of Clovis, king of the Franks. She was the chief means of securing the conversion of her husband to Christianity, and largely influenced his life. After his death she lived a life of austerity at Tours. She was canonized a few years after her death. Her remains were buried in the Church of St. G enevi ve at Paris, and burned at the Revolution to prevent their desecration; the ashes are still in the Church of St. Leu.

Cl ture, kl -t r. See CLOSURE.

Cloud, St., or **Clodoald**, son of Clodomir, and grandson of Clovis, king of France. After the death of his father, and the murder of his two brothers, he became a monk, and found refuge in a monastery near Paris, which took from him the name of St. Cloud. He died there in 560.

Cloud'berry, a plant (*Rubus cham morus*) called also knoberry, mountain bramble, and mountain raspberry, is found in peat-bogs and swamps from Maine and New Hampshire westward and northward to Alaska. The plant is of humble growth, the leaves few, large-lobed, and kidney-shaped, the flower large and white, the fruit orange-red, and of an agreeable flavor. It is a native of the northern parts of America, Europe, and Asia. In Great Britain it is chiefly confined to elevated moors. In Norway and Sweden it is much more abundant; the fruit is highly valued, and makes excellent preserves.

Cloud-burst, a sudden and violent rainfall, covering a limited territory, and of brief duration. It occurs in the hottest season, and most frequently on the slopes of mountains and in arid regions, and is generally accompanied by severe and continuous lightning. The cloud-burst is caused by the contact of a warm current of air, surcharged with moisture, with a cold current, the result being swift condensation and immediate precipitation of the water formed.

Clouds, masses of minute globules of water or crystals of ice and snow suspended in the atmosphere.

The minute globules of water that make the cloud are evidently condensed from the invisible moisture that is always present in the air in greater or less quantities. The studies of Aitken, J. J. Thompson, Wilson, and others have thrown considerable light on the processes of condensation. If pure, dry air,—that is, air from which all dust and traces of electricity have been removed,—be mixed with pure vapor of water, and the moisture be cooled below the temperature of saturation, it will be found that condensation of water vapor does not generally occur. If, however, fine dust be injected into the pure mixture without altering its temperature or pressure, a fine mist is developed at once. It has also been discovered that if a charge of electricity, however small, be introduced, condensation takes place at once. From these experiments it is inferred that nuclei of some

sort, such as dust particles or electric particles, are necessary for the formation of water globules, other conditions being favorable.

The original classification of clouds by Howard in 1803 took account of form only. A more recent classification—the one now in general use—takes account of both the form of the cloud and its altitude. In this system three principal forms are recognized, namely, cirrus, cumulus, and stratus, with their modifications. These three main classes present the most obvious differences in form and shape; they develop at widely different altitudes and move with varying velocities. It is possible to further subdivide each class into a number of varieties, and in practice this is done when an observer becomes skilled in distinguishing the special forms and subdivisions of the main types.

The definitions of the principal types as recommended by the International Cloud Committee, and generally adopted by meteorologists, are given below.

Cirrus (Ci.).—Isolated feathery clouds of fine fibrous texture, generally of a white color, frequently arranged in bands, which spread like the meridians on a celestial globe over a part of the sky and converge in perspective toward one or two opposite points of the horizon. (In the formation of such bands Ci. S. and Ci. Cu. often take part.)

Cirrus clouds are the highest of all and move with the greatest velocity. They develop up to a height of about 10 miles, although their mean height is a little over 6 miles, being higher in summer than in winter. Their average velocity in winter is about 75 miles per hour, and in summer 65 miles per hour. They may be formed by mixture of air strata of different temperatures, or by the cooling of a moist streak in the upper atmosphere by expansion and radiation. In the latter case, if the surrounding air be very dry, the newly formed cloud is soon dissipated.

Cirro-stratus (Ci. S.).—Fine whitish veil, sometimes quite diffuse, giving a whitish appearance to the sky, and called by many cirrus haze, and sometimes of more or less distinct structure, exhibiting tangled fibres. The veil often produces halos around the sun and moon.

This cloud, as its name indicates, is one of the composite forms. Its structure is much on the same order as that of pure cirrus; in fact it is generally composed of cirrus fibres tangled and interlaced in a most complex manner. The variety of forms, however, is practically unlimited, and it undergoes rapid changes, especially in advance of a cyclonic disturbance. Like cirrus, it is composed of crystals of snow or ice, develops at a great elevation and moves with high velocity.

Cirro-cumulus (Ci. Cu.).—Fleecy cloud. Small white balls and wisps without shadows, or with very faint shadows, which are arranged in groups and often in rows.

This is a broken layer of cloud, of which the component masses are not fibrous, like cirrus, but more or less rounded. A second, although rather rare form of cirro-cumulus is the mackerel sky of northern Europe. The cloudlets in this case are rounded, but not fleecy. The altitude of cirro-cumulus ranges from four to six miles, and its movement, like cirrus and cirro-stratus, is quite rapid.

CLOUDS

Cumulus (Cu.).—Woolpack clouds. Thick clouds whose summits are domes with protuberances, but whose bases are flat. These clouds appear to form in a diurnal ascensional movement which is almost always apparent. When the cloud is opposite the sun the surfaces which are usually seen by the observer are more brilliant than the edges of the protuberances. When the illumination comes from the side this cloud shows a strong actual shadow; on the sunny side of the sky, however, it appears dark with bright edges. The true cumulus shows a sharp border above and below. It is often torn by strong winds, and the detached parts (*fracto-cumulus*) present continual changes.

This cloud is undoubtedly formed by the condensation of water vapor in the summit of an ascending column of air. The flat base of the cloud marks the level when the condensation temperature is reached, and the upper dome-shaped summit represents the head of the air column protruding into colder space. In the temperate latitudes it is usually a cloud of the warm season and forms at an altitude of about a mile above the surface of the earth. Its average rate of movement ranges from about 20 miles per hour in summer to 30 in winter. There are many special varieties and forms of cumulus cloud.

Alto-cumulus (A. Cu.).—Dense fleecy cloud. Larger whitish or grayish balls with shaded portions, grouped in flocks or rows, frequently so close together that their edges meet. The different balls are generally larger and more compact (passing into S. Cu.) toward the centre of the group, and more delicate and wispy (passing into Ci. Cu.) on its edges. They are very frequently arranged in lines in one or two directions.

Alto-cumulus clouds may occur when the ascending currents are not strong enough or do not persist long enough to form thick cumuli, or they may represent the vapor that is condensed in the upper portion of a series of atmospheric waves as suggested by Von Helmholtz. The alto-cumulus level ranges from one and a half to two miles. It is higher than the cumulus level, although the summits of cumulus clouds often penetrate into and above it. The mean velocity of alto-cumulus clouds is about 40 miles per hour, being somewhat higher in winter and lower in summer.

Cumulo-nimbus (Cu. N.).—Thunder cloud; shower cloud. Heavy masses of clouds, rising like mountains, towers, or anvils, generally surrounded at the top by a veil or screen of fibrous texture ("false cirrus") and below by nimbus-like masses of clouds. From their base generally fall local showers of rain or snow, and sometimes hail or sleet. The upper edges are either of compact cumulus-like outline, and form massive summits, surrounded by delicate false cirrus, or the edges themselves are drawn out into cirrus-like filaments. This last form is most common in spring showers. The front of thunderstorm clouds of wide extent sometimes shows a great arch stretching across a portion of the sky, which is uniformly lighter in color.

Cumulo-nimbus clouds are of massive dimensions and the most impressive of all clouds in the realm of nature. The upper surface of this cloud, which is sharp and well defined in the earlier stages of its formations, becomes soft and wispy soon after rain begins to fall from its base. The cloud itself may be divided into three planes, namely, the lower, consisting of vapor, the middle of water, and the upper of ice or snow. The tops of some of these clouds reach 6 or 8 or even 10 miles into the atmosphere. Prof. Bigelow computes that the temperature in one of the loftiest of these clouds

ever observed fell from 79.5° F. at the ground to -74° F. at a height of nearly nine miles.

Stratus (S.).—Lifted fog in a horizontal stratum. When this stratum is torn by the wind or mountain summits into irregular fragments they may be called "*fracto-stratus*."

This cloud, as its name implies, is merely a horizontal sheet floating at a low elevation and without any special structure. It is generally formed by the intermingling at the surface of contact of air strata of different temperatures, and it indicates a horizontal flow of air rather than an ascensional movement in the case of cumulus clouds.

The average elevation of stratus clouds is less than half a mile, and their average velocity about 15 miles per hour.

Strato-cumulus (S. Cu.).—Large balls or rolls of dark cloud, which frequently cover the whole sky, especially in winter, and give it at times an undulated appearance. The stratum of strato-cumulus is usually not very thick, and blue sky often appears in breaks through it. Between this form and the alto-cumulus all possible gradations are found. It is distinguished from nimbus by the ball-like or rolled form, and because it does not tend to bring rain.

This cloud is not sufficiently uniform to be called stratus, nor sufficiently lumpy to be called cumulus. It is a cloud of moderate elevation, about 9,400 feet in summer, and 7,800 feet in winter, and its rate of movement varies from 20 to 30 miles per hour. It is often a thin cloud through which patches of blue sky can be seen. Again it covers the sky completely, and presents a gentle undulating surface with a tendency to break up into long parallel rolls or bars.

Alto-stratus (A. S.).—Thick veil of a gray or bluish color, exhibiting in the vicinity of the sun and moon a brighter portion, and which, without causing halos, may produce coronæ. This form shows gradual transitions to cirro-stratus, but, according to the measurements made at Upsala, was only one half the altitude.

The average height of this cloud is about three and a half miles in summer and three miles in winter. Its average velocity ranges from 40 to 50 miles per hour.

Nimbus (N.).—Rain cloud. Dense masses of dark formless clouds with ragged edges, from which generally continuous rain or snow is falling. Through the breaks in these clouds there is almost always seen a high sheet of cirro-stratus or alto-stratus. If the mass of nimbus is torn up into small patches, or if low fragments of cloud are floating much below a great nimbus, they may be called "*fracto-nimbus*" ("scud" of the sailors).

As soon as rain falls from a cloud it is called a nimbus, whatever its form before the beginning of rain, with one exception, namely, when rain begins to fall from a lofty cumulus cloud it is called a cumulo-nimbus to distinguish it from a system of pure nimbus clouds, the latter being flatter and more in the nature of a sheet cloud.

Colors of Clouds.—The brilliant colors sometimes assumed by clouds at sunrise and sunset are probably caused by selective absorption and reflection of light by dust particles or vapor haze in the atmosphere. The clouds of the day-time, especially those having a great elevation, are white, since they reflect the greater part of the light incident on them.

The bases of cumuli are generally of a dark shade, while the portions in shadow are mostly of a pearl gray.

CLOUD FORMS.



Cirrus.



Cirriform.



Cirro-stratus



Cirro-cumulus



Alto-stratus



Strato-cumulus



Alto-cumulus



Nimbus



Nimbus



Cumulus



Cumulus.



Cumulus-nimbus.

CLOUDS.



1. CUMULUS.

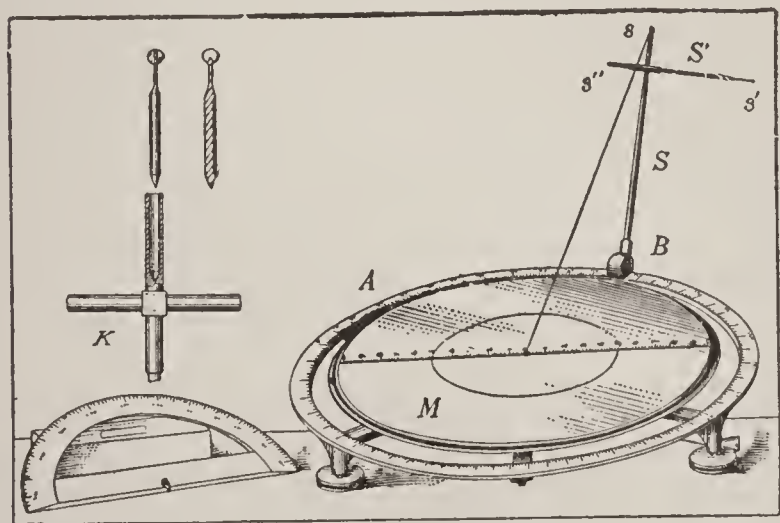
2. CIRRUS.

CLOUDS — CLOUET

Thunder clouds sometimes have an olive-green tint, and this is thought by some observers to portend high winds and heavy rain-fall.

Utilization of Clouds in Weather Forecasts.—This subject has been the subject of considerable study by Ley, Abercromby, and others in Europe, and by McAdie, Clayton, and the writer in the United States. In forecasting weather changes from synoptic charts the clouds frequently show the advance of a cyclonic disturbance, but not before the same information is given by the circulation of the surface winds and the fall in the barometer. Unfortunately it is not possible to fully describe and telegraph the significant features of the various cloud forms so that they may be available at a central weather station; in the case of a solitary observer, however, some skill in making local predictions of the weather may be attained by a careful study of cloud forms in connection with falling weather.

Methods of Observation.—The kind, amount, and direction of clouds form a part of meteorological observations whether made for purposes of weather forecasting or for purely climatic studies. In the last-named event it is chiefly desired to know the extent of sky covered with cloud on the average of the season, since one is then able to judge of the nature of the climate with respect to sunshine. In weather forecasting it is important to know, not only the kind of cloud observed, but both its direction and apparent velocity, although in actual practice the last named is rarely attained. This information is best obtained by means of the nephoscope. An excellent form of nephoscope was devised by Prof. C. F. Marvin, United States Weather Bureau, in 1896. Prof. Marvin's nephoscope is shown in the illustration.



The Improved Nephoscope.

The circular frame, A, is mounted upon three leveling-screws, and its upper surface is graduated to degrees, numbered from 0 to 360, the numbers increasing in a direction contrary to the direction of motion of clock hands. The plate and mirror, M, revolve smoothly within the circular rim, A, being carried upon a hollow vertical axis at the centre. The arm, B, carrying the sighting staff, S, also revolves upon the central axis, the outer end traversing the narrow annular space between the mirror and graduated rim. The staff, S, is telescopic in construction, and is attached to the arm at B by a hinge which permits the staff to be in-

clined from the vertical to any extent, but always in a plane perpendicular to the mirror. The top portion of the staff is provided with a crosshead, which is surmounted by a small sighting-knob, s. The crosshead is adapted to receive the secondary staff, S', which slides with gentle friction through the crosshead, and is tipped at either end with small secondary sighting-knobs, s' and s''. By reason of the telescopic construction of the staff, S, the crosshead can not only be turned about in any direction, but it and the sighting-knob, s, can be raised by various amounts, being held in place by friction. The hinge at B is made in such a manner that when the staff, S, is placed in a vertical position, the small rod sliding inside can be forced down into a hole in the hinge, the effect of which is to lock the hinge so that the staff is held rigidly in a vertical position.

In using the nephoscope the observer looks down upon the mirror, M, and observes the reflection of the cloud. By moving his eye he brings a point of the cloud image and the reflection of the sighting-knob, s, into coincidence at the centre of the mirror. The head should be held so that the knob is always seen at the centre of the mirror. The cloud image will then appear to move away from the centre of the mirror. The mirror is then revolved until the graduated line becomes parallel with the motion of the cloud, when its direction of motion may be read off and its apparent velocity determined by timing the image as it passes along the graduated scale of the mirror.

Other forms of the nephoscope have been devised and used, mostly in European countries, and Prof. Cleveland Abbe, of the United States Weather Bureau, has devised a very convenient form of nephoscope for use on vessels at sea.

In determining the height of clouds, direct observations of their angular altitude are made by two observers at the ends of a measured base-line, whence the altitude may be computed by trigonometric formulæ. The same results may be obtained by photography, but the method is not so direct, and the computations are more laborious.

ALFRED J. HENRY,

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Clouds, The, a comedy by Aristophanes; acted in 423 B.C. Though one of the most interesting and poetic of the author's plays, the people refused to hear it a second time. But its literary popularity counterbalanced its failure on the stage.

Clouet, kloo-ā, French family of artists, descendants from Flemish ancestry. 1. JEHAN, yā'hān, the first known of the family, was in 1475 a resident of Brussels. 2. His son JEHANNET, yā-hān'nēt: b. 1485; d. 1541, migrated to France and located at Tours. In 1518 he went to Paris and became court painter to Francis I. A portrait of the king, in the Louvre, is said to have been painted by this artist, also another portrait of the king, in the Pitti Gallery, Florence, is credited to him. Several other pictures in European galleries are said to have been painted by him. In all the style is that of the Flemish school. 3. FRANÇOIS, frāñ-swā, son of Jehannet: b. 1510; d. 1572. succeeded his father as court painter to Francis I., and retained the position under Henry II., Francis II., Charles IX., and Henry III. His

CLOUGH — CLOVE-BARK

works are mentioned in the records of the court. Some authorities mention a brother of François, but of him nothing positive is known.

Clough, Anne Jemima, English educator: b. Liverpool, Eng., 20 Jan. 1820; d. Cambridge 27 Feb. 1892. She was a sister of Arthur Hugh Clough (q.v.), and after a girlhood spent in Charleston, S. C., opened a day school in 1842. Becoming interested in the general subject of education the North of England Council for Promoting the Higher Education of Women was founded through her efforts, and from this sprang the idea of the Cambridge higher local examinations. Lectures for women having been established at Cambridge in 1869 Miss Clough, in October 1871, took charge of a house of five women students, out of which grew the present Newnham College, over the administration of which she presided until her death. During her busy career she accomplished much for the higher education of English women. See B. A. Clough, 'Memoir of Anne J. Clough' (1897).

Clough, klūf, Arthur Hugh, English poet: b. Liverpool 1 Jan. 1819; d. Florence, Italy, 13 Nov. 1862. He studied under Arnold at Rugby, then at Balliol College, Oxford, and became a fellow of Oriel College in 1842. In 1848 he visited Paris, and spent the winter of the following year in Rome. In 1849 he became head of University Hall, London, but resigned in 1852 and went to America, where he lived for a few months at Cambridge, Mass. On his return next year he was appointed an examiner in the education office. His poems were published, along with a genial memoir, by F. T. Palgrave in 1862; his poems and prose remains, with letters and a memoir, were also published by his wife in 1869. 'The Bothie of Tober-na-Vuolich' (1848), is his best known poem; others are 'Dipsychus' and 'Amours de Voyage.' They are masculine and vigorous in tone, and contain many noble thoughts, and strokes of genuine humor, alternating with passages of deep pathos and tenderness. He is affectionately commemorated in Matthew Arnold's 'Thyrsis' and 'Scholar Gypsy.'

Clough-Leigher, klūf'-lā'tēr, Henry, American organist and composer: b. Washington, D. C., 13 May 1874. He studied at Columbia University 1887-9, and at Trinity University, Toronto, Canada. He was organist at various Washington churches 1890-99, of Grace Church, Providence, R. I., 1899-1900, and since 1900, has been instructor in musical ethics and theory in the Howe School of Music, Boston, Mass. Among his many compositions are a Festival Service in D major (1896); 'Te Deum Laudamus,' G major (1898); 'Te Deum Laudamus,' G minor (1901); song, 'Like a Rose Should Be' (1901).

Clous, John Walter, American soldier: b. Germany 9 June 1837. He came to America in 1855 and engaged in business. He enlisted in the United States army 2 Feb. 1857, and was promoted second lieutenant 29 Nov. 1862. He took part in the siege of Yorktown, the Seven Days' battles in June 1862, Malvern Hill, Second Bull Run, Antietam, Frederickburg, Chancellorsville, and Gettysburg, being twice brevetted for gallant conduct at the latter. He served on the frontier and in Indian campaigns

1868-86, as judge advocate in many important trials and cases 1862-86, was assistant to the judge advocate-general 1886-90, and professor of law at West Point 1890-6. During the Spanish-American war he was appointed a brigadier-general of volunteers, and served on the staff of Maj.-Gen. Miles. He attained his lieutenant-colonelcy 12 Feb. 1892. He is the author of lectures on 'Military and Martial Law and Suspension of the Writ of Habeas Corpus,' delivered at Union College in the Butterfield lecture course.

Clove, the unexpanded flower-bud of an East Indian tree (*Caryophyllus aromaticus*) somewhat resembling the laurel in its height and in the shape of its leaves. The flowers grow in clusters, and the petals are small, rounded, and of a bluish color; the seed is an oval berry. The Molucca Islands, where the raising of different spices was formerly carried on by the Dutch colonists to a great extent, appear to be the native land of the clove, and the best are still brought from that quarter. At one time, however, in order to secure a lucrative branch of commerce in this article to themselves, the Dutch destroyed all the trees growing in other islands, and confined the propagation of them to that of Ternate. But both clove- and nutmeg-trees were transplanted from the Moluccas into the islands of Mauritius and Bourbon, and the clove is now cultivated with success in many warm countries, including Zanzibar and the West India islands. At a certain season of the year the clove-tree produces a vast profusion of flowers. The operation of gathering is performed between the months of October and February, partly by hand, partly by hooks, and partly by beating the trees with bamboos. The cloves are subsequently dried by exposure to the smoke of wood fires, afterward to the rays of the sun. When first gathered they are of a reddish color, but by drying they assume a deep-brown cast. This spice yields a very fragrant odor and has a bitterish, pungent, and warm taste. It is most frequently used in culinary preparations. When fresh gathered, cloves will yield, on pressure, a fragrant, thick, and reddish oil; and by distillation a limpid essential oil.

The medical value of cloves is due to the presence of eugenol, C₁₀H₁₂O₂, in the volatile oil. Eugenol is extremely active, acting like the phenol, or carbolic acid group, to which it is related. Clove is a marked local anæsthetic, a strong antiseptic and bactericide, an excellent stimulant to the sympathetic nervous system, expelling flatus from the stomach and the intestines, by increased peristalsis, and increasing the flow of the gastric and intestinal juices. Its value in toothache is due to its anæsthetic and bactericidal properties. A number of new compounds of eugenol are on the market. Benzoyl-eugenol and cinnamyl-eugenol are used in the treatment of tuberculosis.

Clove-bark, the bark of various aromatic trees, used in the manufacture of drugs and spices. A tree (*Dicypellium caryophyllatum*) of Brazil supplies a cinnamon-like cylinder which is commonly known as clove-bark in the American markets, and is used in medicine as *cassia caryophyllata*. The name is often given also to *culilawan* and cinnamon.

CLOUDS.



1. Cumulus.

2. Strato Cumulus.

CLOVE-PINK — CLOVER

Clove-pink, or **Clove gilly Flower**, the carnation (*Dianthus caryophyllus*), more especially a whole-colored, clove-scented variety of it.

Clover, **Lewis Pierre**, American lawyer and journalist: b. Springfield, Ill., 1864. He was educated at Racine College, Wisconsin, and admitted to the bar of Illinois in 1885. He is a great-grandson of Ninian Edwards, a former governor of Illinois, and grandson of Ninian W. Edwards, a distinguished Illinois lawyer. He is a grand-nephew of Mary Todd Lincoln. He has been a member of the staff of the *New York Evening Sun* for several years, writing upon legal subjects and proceedings.

Clover, species of the genus *Trifolium*, belonging to the pea family (*Papilionaceæ*) and to the natural order *Leguminosæ*. Of *Trifolium* about 300 species have been described; they are most abundant in the north temperate zone, a few in South America and South Africa. Some are very important in agriculture, either for pasturage, fodder, or for soil-improvement.

The word "clover" is also applied to species of related genera, as bur-clover (*Medicago*), sweet clover (*Melilotus*), bush and Japanese clovers (*Lespedezas*), prairie clover (*Petalostemon*), etc.

The true clovers (*Trifolium*) are herbs with mostly three foliate leaves; purple, pink, white, or yellow small flowers in dense heads or spikes; and straight membranous pods containing one to four seeds.

The most important species to the farmer is the common red clover (*Trifolium pratense*), now naturalized here, but believed to be a native of Europe and northern Asia. It has been grown in England for over 300 years. It is a more or less hairy perennial, growing from six inches to two feet high. The leaflets are usually three in number, short-stalked, springing from the same point, oval, and often having a whitish horseshoe mark in the centre. The flower-heads are dense, oval or ovoid, about one inch long; florets sessile or nearly so, red, rarely white, remaining erect in fruit; calyx sparingly hairy. It is one of our best forage plants for nutritive value, high yield, and good range of adaptability; it is commonly found in meadows and pastures, and is used as a green manure. It flowers from April to November. The seed weighs about 60 pounds to the bushel, and, if sown alone, 10 to 12 pounds will sow an acre.

Perennial red clover (*Trifolium pratense perenne*) may be regarded as an offshoot of common clover, from which it differs in being of longer duration and hardier. Zigzag clover, Cow-grass and Marl-grass or Mammoth clover (*Trifolium medium*) may be an offshoot of *T. pratense*, from which it differs in being a larger plant, having zigzag stems, the flower heads larger, longer stalked, and often of a deeper purple color, with a practically smooth calyx tube. The leaflets have no horseshoe mark. It is native of Europe and Siberia and blooms during the summer.

Alsike or Swedish clover (*Trifolium hybridum*) is an erect perennial, growing one to two feet high. Its flowers are pink to white and are open about the same time as those of timothy. It is suited to heavy clay soils and is the only clover that will stand irrigation. It has smaller and shallower roots than com-

mon clover. It is sometimes sown alone, when, owing to its small seed, four pounds per acre is sufficient. It is better suited to mixtures. It was introduced into Great Britain from Sweden in 1834.

White, Dutch, or honeysuckle clover (*T. repens*) is a common perennial, low-growing plant with white to pinkish flowers, native of Europe, Siberia, and perhaps of the northern United States. Its method of seeding makes it permanent. As its yield is small it is seldom grown alone, but is often incorporated in mixtures. It is a bee-plant and is common on nearly all soils. See DUTCH CLOVER.

Crimson, carnation, Italian or scarlet clover (*T. incarnatum*) is an erect, hairy annual, growing six inches to three feet high. The leaflets are nearly sessile, the flower-heads are terminal, oblong, or ovoid, one to two and a half inches long; flowers red, purple, pink, or white, sessile; calyx hairy. It is often grown as a catch or cover crop in orchards, etc., and sometimes for grazing and hay. It is quite ornamental and is now grown by the florist.

Yellow clover or hop clover (*T. agrarium*) is a hairless or slightly hairy annual clover, growing 6 to 18 inches high, with small yellow flowers which are open between May and September. It is common along roadsides and waste places.

T. procumbens is also called yellow clover, or hop clover; it is more spreading and hairy than the above. It is common on dry soils.

Alexandrian or Egyptian clover (*T. alexandrinum*) is an annual, bearing oval, pale yellow, or whitish flowers. As it is an important fodder in Egypt it is presumed that it will be of value for the southern States.

Moliner's clover (*T. molineri*) is a biennial with pale flowers. Rabbit-foot, stone or old field clover (*T. arvense*) is a common annual of no value.

T. dubium or *minus* is the least hop clover or hop-trefoil, also called yellow suckling clover, and is regarded by some as the true shamrock.

Uses and Feeding Value.—Clovers are grown for hay, pasture, soiling, silage, green-manuring, cover-crops, and soil improvement. Clovers or some other legume should have a place in every rotation, because of their deep, fleshy root system and capacity for appropriating free nitrogen from the air in the soil by means of bacteria on their roots. Their deep roots penetrate the subsoil and transfer valuable plant food to the surface soil, which is liberated when they decay. It has long been known that the growing of legumes improved the soil; Pliny recommended that such crops be grown previous to grain crops. The wisdom of this is now supported by recent research. In 1888 it was announced that the nodules on the roots of leguminous plants were colonies of bacteria, and that their work was to take up nitrogen from the soil-air for the benefit of their host; hence we have the fact that a large quantity of nitrogen may be removed from the soil for a series of years in the form of clover-hay or alfalfa hay—yet the surface soil be richer in nitrogen at the end of the period than it was at the beginning. Plowing a crop of clover under as green-manure is a very effective way of enriching the soil in humus. This is now practised in orchards to a considerable extent; the tillage they receive and the

CLOVER-WEEVIL — CLOVIS

crops removed rapidly deplete the fertility of the land, hence the introduction of the practice of seeding down the orchards during the summer with some legume, as crimson clover, cow-peas, soy-beans, etc., to add humus, protect the land from washing during the fall and winter, and in wet seasons, by using up the moisture, to aid in maturing the buds of the trees and enable them to stand the winter; the crop being plowed under the following spring when cultivation begins.

The average percentage composition of clover is given as —

	Protein	Nitrogen-free extract	Ether extract	Crude fibre	Ash	Water
Red clover, green..	4.4	13.5	1.1	8.1	2.1	70.8
Alsike clover.....	3.9	11.0	0.9	7.4	2.0	74.8
Red clover, silage..	4.2	11.6	1.2	8.4	2.6	72.0
Red clover hay....	12.3	38.1	3.3	24.8	6.2	15.3
Alsike clover hay..	12.8	40.7	2.9	25.6	8.3	9.7

With ruminants the average coefficient of digestibility is —

	Dry matter	Protein	Nitrogen-free extract	Crude extract	Crude fibre
Red clover, green..	66	67	78	65	53
Red clover hay....	61	62	69	62	49

At the Wisconsin station, clover cut three times in one year yielded 25 tons of green forage per acre; this may be regarded as a maximum yield. The first cutting, made 29 May contained only 8.2 per cent of dry matter, and was on this account unsatisfactory as a soiling crop, although, generally speaking, this crop is a most valuable one for this purpose, being relished by all stock. The total dry matter contained in the three crops was nearly four tons per acre.

If given in excess while green, or grazed, it is liable to cause bloat. To prevent this, give dry fodder in addition, and do not turn the animals out when they are very hungry or the dew is on. Clover pasture is excellent for growing pigs, and they may be fattened on it.

Experience has shown that the best time to cut clover for hay is when one third of the heads are turning brown. As ordinarily cured it is liable to be dusty, hence it is not considered a satisfactory feed for horses. For growing and idle horses, bright, clean clover hay is both economical and valuable. Hay from over-ripe crimson clover is dangerous for horses; the bristly hairs, accumulating in the intestines, form balls, causing stoppages and death. Clover hay is a most valuable forage for cattle, especially milch cows; 10 to 12 pounds may be fed daily, its high nitrogen content permitting a reduction of the amount of concentrated feed. It is one of the best coarse fodders for sheep, and when

chaffed fine is used for feeding laying hens in winter.

Clover Diseases.—The common diseases are: Clover rust (*Uromyces trifolia*), which appears in various stages on the leaves, leaf-stalks, and stems of the plant, particularly white clover. White minute cups appear in spring or early summer, accompanied or followed by small brown spores, which are finally followed by darker spores which live through the winter and germinate the following spring.

Clover rot (*Sclerotinia trifoliorum*) attacks many legumes. The disease causes a browning of the stem and leaves, which are soon spotted with a white mold, which ultimately forms solid, wavy black bodies often half an inch long. These produce mushroom-like bodies the following spring. Burning over the infested field and a proper rotation of crops are advocated for both diseases.

A leaf-spot (*Pseudopeziza trifolii*) is often destructive, especially during a wet fall. The leaves are covered with small black spots. Dodder (q.v.) is a parasitic plant responsible for considerable loss in some places.

Clover Insects.—Of the various insects which injure clover the following are prominent: The clover-root borer (*Hylastes trifolii*) which has in some sections killed out the clover the second year, thus necessitating a change in the rotation of the crops. The clover-stem borer (*Languria mozardi*) is widely distributed. The clover-leaf beetle (*Phytonomus punctatus*) is a weevil which feeds at night, consuming all parts of the plant. The clover-leaf midge (*Cecidomyia leguminicola*) is one of the worst pests; the eggs are laid in the blossoms, where the larvæ feed on what should be the seed. They pupate in the ground or in the seed. There are two or three broods annually. Various insects attack the stored hay, the most common being the clover-hay worm (*Asopia costalis*).

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Clover-weevil, a kind of weevil, of the genus *Apion*, different species of which, or their larvæ, feed on the leaves and seeds of the clover, as also on tares and other leguminous plants. *A. apricans*, of a bluish-black color and little more than a line in length, is especially destructive. See WEEVIL.

Cloves, Oil of. See CLOVE.

Clo'vis, king of the Franks: b. 465; d. Paris 27 Nov. 511. He succeeded his father Childeric in the year 481, as chief of the warlike tribe of Salian Franks. He united with Ragnacaire, king of Cambrai, declared war upon Syagrius, the Roman governor at Soissons, and utterly routed the Romans near Soissons, in 486. Soissons was then made the capital of the new kingdom of the Salian Franks. Clovis married Clotilda of Burgundy, who had been educated in the Christian faith, and was desirous that her husband also should become a Christian. When he was hard pressed in a battle against the Alemanni at Tolbiac in 496, Clovis called on the God of Clotilda and the Christians. Consequently, when the victory was won, and territory of the Alemanni submitted to him, he was solemnly baptized at Rheims, 25 Dec. 496, with several thousand Franks, men and women. Hos-

tilities soon broke out between Alaric, king of the Visigoths, and Clovis. In the battle fought at Vouglé, near Poitiers, the latter gained a complete victory, slaying his enemy with his own hand. After this victory Clovis received the honor of the consulship from the Emperor Anastasius. In the last year of his reign Clovis had called a council at Orleans, from which are dated the peculiar privileges claimed by the kings of France in opposition to the Pope.

Clovis II., king of Neustria and Burgundy: d. 655. He was the second son of Dagobert, whom he succeeded in 638.

Clovis III., king of France: d. 695. He was the son of Thierry III., whom he succeeded in 691 at the age of nine. He reigned five years, under the guardianship of Pepin d'Heristal, mayor of the palace.

Clowes, klowz, Frank, English chemist: b. Bradford, Yorkshire, 1848. He was educated at the Royal School of Mines, London; Royal College of Science, Dublin; and the University of Würzburg, and was professor of chemistry at University College, Nottingham, 1881-97, and emeritus professor since 1897. He has published: 'Text-book of Practical Chemistry and Qualitative Analysis'; 'Text-book of Quantitative Analysis'; 'Elementary Practical Chemistry'; 'Introductory Quantitative Analysis' (1890); etc.

Clowes, Sir William Laird, English naval critic: b. London 1 Feb. 1856; d. there, 14 Aug. 1905. He was educated at King's College, London; and from 1876 to 1895 was correspondent for various newspapers. He wrote much on naval development, and on art and sociology. His works include: 'The Naval Pocket Book,' issued annually; 'The Needs of the Navy'; 'Four Naval Campaigns' (1902); and the novels, 'The Captain of the Mary Rose' (1892); 'Blood is Thicker Than Water' (1894); 'The Great Peril' (1893); 'The Double Emperor' (1894); 'Told to the Marines' (1902); and also 'The Miniature Cyclopaedia' (1888); 'Black America' (1892); 'Eclogues' (1889). He was the editor and chief contributor to 'The Royal Navy; a History from the Earliest Times to the Present' (1897-1902). He was knighted in 1902.

Clown, a role peculiar to the stage of English-speaking people, but bearing some resemblance to the *gracioso* of the Spaniards, and the *Hanswurst* of the Germans. The origin of the word is uncertain, some deriving it from the Latin *colonus*, in the sense of a peasant farmer, and others connecting it with certain Scandinavian and other Teutonic words. On the old English stage the clown was the privileged laughter-provoker, who, without taking any part in the dramatic development of the piece represented, carried on his improvised jokes and tricks with the actors, often indeed addressing himself directly to the audience instead of confining himself to what was going on on the stage. In Shakespeare, on the contrary, a distinct part was assigned to the clown, who no longer appears as an extempore jester, although the part he plays is to a certain extent in keeping with his traditional functions. At a later period the clown was altogether banished from tragedy, and allowed to appear only in the after-piece, performing gro-

tesque dances, singing comic songs, etc. He is now confined to the pantomime and the circus, in the former of which he plays a part allied to that of the French Pierrot.

Cloyd's Mountain, Battle of. On 3 May 1864 Gen. George Crook of the Union army marched from Fayette, W. Va., to break the Virginia & T. R.R. at the New River bridge. He had 11 regiments of infantry and 2 batteries of artillery, in all about 6,100 men, brigaded under Col. H. G. Sickel, C. B. White, and R. B. Hayes. He marched through Raleigh, drove a small Confederate cavalry force from Princeton, and on the 8th reached Shannon's Bridge, seven miles from Dublin, where he was joined by 400 cavalry. Here he found next morning that the Confederates—three regiments and a battalion of infantry and two batteries—under Gen. A. G. Jenkins and Col. John McCausland, were barring his way, strongly posted behind log and rail breastworks, on a steep and thickly wooded spur of Cloyd's Mountain, with guns sweeping the road and open country in front. Crook opened on the position with artillery, and then, under cover of the timber, sent White with his own brigade and two regiments of Sickel's to turn the enemy's right, and the moment they were engaged Sickel and Hayes charged directly to the front across a meadow swept by artillery and musketry fire, and up the steep ridge. Parts of the line were repulsed, again to rally and go forward, and after a hard contest, in which bayonets and clubbed muskets were used across the works, they were carried, the Confederates retreating to Dublin, leaving, as Crook reports, 230 unwounded men as prisoners, and two guns, in his hands. The Union loss was over 600, that of the Confederates about 500. Gen. Jenkins was mortally wounded and left on the field. Crook followed the retreating troops, and when near Dublin encountered about 500 of Gen. John H. Morgan's command, under Col. Smith, that had come from Sattville, and endeavored to cover McCausland's retreat. These Crook drove back, and at night he occupied Dublin. On the 10th he marched to Newborn and thence to New River Bridge, which McCausland tried to save, but after a two-hours' artillery duel in which Crook had 11 men killed and wounded, he seized and destroyed the bridge and the railroad for a considerable distance, then marched by way of Union, Alderson's Ferry, and Lewisburg to Meadow Bluff, which he reached on the 19th, his march harassed by the enemy's cavalry. Crook's entire loss was 109 killed, 513 wounded, and 72 missing. On his return march he was obliged to leave 200 of his wounded, with surgeons, who were captured. The Confederate loss, as reported, was 76 killed, 262 wounded, and 200 missing or captured. Consult: 'Official Records,' Vol. XXXVII; Pond, 'The Shenandoah Valley in 1864.'

E. A. CARMAN.

Cloyne, Ireland, a town 16 miles south-east of Cork. It has an ancient cathedral, near which is a round tower, a Roman Catholic chapel, a free school, founded by Bishop Crow in 1726; besides national schools. From 1638 to 1833 it was the see of a bishop belonging to the Established Church of Ireland, but in the latter year it was united with Cork and

CLUB

Ross. From 1734 to 1753 George Berkeley, the philosopher, was bishop of Cloyne. Pop. 1,300.

Club, a company of persons associated for some common object—social, literary, political, etc. It has been claimed that social clubs were known to the ancient Romans, but the evidence of their existence is scanty. Inscriptions tell of clubs of Roman citizens in foreign cities, and also of military clubs. For several centuries the club has been a peculiar institution in England, and of late it has become a prominent feature in American life. It is not easy to determine at what time clubs originated in England, but Occleve mentions one to which he belonged (during the reign of Henry IV.), called "La Court de Bone Compaignie." In 1659 Aubrey explained the word "clubbe" as meaning "a sodality in a tavern." He adds, "Here we had a balloting-box and balloted how things should be carried." The earliest London club of any celebrity was established about the beginning of the 17th century, at the Mermaid Tavern, Friday Street (otherwise known as Bread Street). Among its members were Shakespeare, Sir Walter Raleigh (the founder), Beaumont, Fletcher, Donne, and Selden. Ben Jonson figured at another club, which met at the Devil Tavern, near Temple Bar. It appears certain that clubs existed alongside of coffee-houses in the 17th and 18th centuries. At that time, however, their character was very different from what it is now. The coffee-houses of those days were the nearest representatives of the modern clubs, while the clubs were commonly nothing but a kind of restaurants or taverns where people resorted to take their meals. There was one feature, however, which was peculiar to clubs from the first, and distinguished them from coffee-houses; namely, that while anybody was free to enter a coffee-house, it was absolutely necessary that a person should have been formally received as a member of a club, according to its regulations, before he was at liberty to enter it. Almack's, Brooks', and White's were among the best known coffee-houses. Among the earliest of the London clubs was the Kit-Cat Club, formed in the reign of Queen Anne. Among its 40 members, who used to meet at the shop of a pastry-cook (Christopher Cat or Katt), in order to do justice to certain mutton pies for which he was famous, were six dukes, among them the Duke of Marlborough; five earls; many of the most distinguished leaders of the Whig party, such as Sunderland, Halifax, Sir Robert Walpole, and others; and several of the leading authors of the day, among them, Vanbrugh, Congreve, Addison, and Steele, the last two owing to the club idea the form given to the 'Spectator.' Another club formed about the same time was the Beefsteak Club. Originally these two clubs had no pronounced political views, but in the end they began to occupy themselves with politics, the Kit-Cat Club being Whig, and the Beefsteak Club, Tory. There have been several Beefsteak clubs since. During the last century it was common to give eccentric names to clubs, and the conditions of being admitted to membership in any one of these clubs were as a rule equally remarkable. Among these may be mentioned the Surly Club; the Split-farthing Club; the Ugly Club (of

which Wilkes was elected president for life, and Mirabeau was an honorary member); the Unfortunate Club; the Lying Club, the members of which were not permitted to utter a single truth during their sittings, unless they had been expressly authorized to do so by the president. Perhaps the most celebrated club of the 18th century was that which was first called The Club, but which was afterward known as the Literary Club. It was founded in 1764, and numbered among its members Dr. Johnson, who was for a long time its president, Sir Joshua Reynolds, Edmund Burke, Oliver Goldsmith, Edward Gibbon, and other distinguished men. In 1864 the 100th anniversary of its foundation was celebrated. In the rules which Dr. Johnson wrote for another club, the Apollo, he coined the still-serviceable word, "clubbable." In 1800 there were only half a dozen clubs existing in London, and within a century there were 100, with a total membership of 80,000. The most important London political clubs of the present day are the Carlton Club, founded by the Duke of Wellington, and the Reform Club. The former is the principal club belonging to the Conservative party in the kingdom, and the building in which its members meet, which is the most palatial edifice of the kind in the kingdom, may be regarded as the headquarters of the Conservative party. This club was founded in 1832, and the number of its members is 1,600. The Reform Club, the building belonging to which stands next to that of the Carlton Club, was long the great club of the Liberal party, founded in 1837, members 1,400. Among the other important London clubs are the National Liberal (7,000 members), Constitutional (6,550), United Service, Athenæum, Army and Navy, Travelers, Garrick, Primrose (5,600), etc. Similar clubs were started in the chief cities of England and in the colonies.

The first French society to take the name club was Le Club Politique, established in 1782, and a few years later, Le Club de Boston, or Club des Américains, was formed in Paris. The political clubs had no regular form, as they were tolerated only during revolutionary epochs. The Club des Jacobins, the Club des Feuillants, the Club des Cordeliers, and the Club de Montrouge were the most famous clubs of the time of the first French Revolution, and formed the storm-centres of that movement. None of the French clubs survived the *coup d'état* of 9 Nov. 1799, by which Napoleon overthrew the Directory. Two clubs were formed during the revolution of 1830, but they were both dissolved by the law relating to associations. At the revolution of February 1848 hosts of clubs started into existence, the most celebrated of which was the Central Republican Society (*Société centrale républicaine*), but their duration was short, for the Constituent Assembly in the following year ordered them all to be closed.

About the same periods as in France, political clubs were introduced into Italy, Germany, and Spain, especially during the time of the first French Revolution and that of 1848. In Germany, however, they were put down by a law of the empire in 1793, and in 1832 a federal decree was issued prohibiting all kinds of political societies and assemblies. In 1848 the number of clubs found in Italy, and particularl

CLUB-FINGERS—CLUB-ROOT

in Germany, was very great, but their collapse was as sudden as their rise. Later in the century municipal clubs, somewhat on the "good government" order, arose in Prussia. The city of Berlin had 75 such organizations in 1896. Some of these clubs maintain death-benefit and savings-bank features. Social clubs of the English type have not spread rapidly on the Continent. In France the name *cercle* was given to clubs of this nature. The most fashionable clubs of Paris are Le Cercle de la rue Royale and the Jockey Club. Many sports besides horse-racing are represented in the club life of the French capital. The automobilists, and the devotees of yachting, fencing, etc., have their separate organizations. There are also cercles for army officers, for literary men, for artists, and one connected with agricultural interests. Alpine clubs (q.v.) are found in many European countries. The French society of that name has numerous branches. Catholic clubs of workmen exist in different parts of the country.

Although clubs were not unknown in the United States toward the close of the 18th century (the Hoboken Turtle Club dating back to that period), yet their spread and development were slow previous to the Civil War. Among those ante-dating the War may be named, the Union Club of New York (1836), the Somerset Club of Boston (1857), and the Maryland Club of Baltimore (1857). The Union League Club of New York (1863) grew out of the purpose to defend and perpetuate the national integrity, to encourage loyalty to the Federal government. Other Union League clubs were formed later in Philadelphia, and other cities; and in all the important centres of the country there grew up large and flourishing societies of a political or social nature, or such as combined the two features. The Manhattan Club became the chief social Democratic club of New York. The St. Nicholas Club represented a different type, a society founded upon a similarity of ancestry or antecedents and endeavoring to preserve historical associations. As these organizations have increased in number they have become more varied in character, until not only politics, science, art, music, literature, sociology, religion, philanthropy, and professional, commercial, social and sporting life are all represented, but the subdivisions are bewildering and continually increasing. Athletic clubs of various kinds are numerous and popular, abroad as well as in America, especially those for golfers and cyclists. The Cycling Tourists' Club, with headquarters in London, has a membership of 45,000.

University clubs draw together the college-bred men of various sections or cities. The largest one of the kind in the United States is that in New York, which had, in 1902, 2,566 members. The city has also a Yale, a Harvard, and a Princeton Club. The Reform Club, organized in 1878, works for good government and agitates the tariff question. Among the largest clubs of the metropolis in addition to those already mentioned are the following: New York Athletic, 2,800 members; New York Yacht, 1,300; Century, 1,172; Army and Navy, 1,200; Metropolitan, 1,040; Players, resident 500, total 1,000; Lotus, resident 600, total 956. Others noteworthy for special characteristics are: The Knickerbocker Club, Authors' Club, Press

Club, Grolier Club, Catholic Club, Holland Society, etc. The Chicago Athletic Club has 2,500. In Philadelphia, in addition to the Union League, the Manufacturers' Club, the Art Club, the Rittenhouse, and the New Century, are numerically strong. Clubs devoted to the cultivation of vocal music are largely formed of the German element in our cities. Prominent among these societies are the Liederkrantz, the Arion, and the Mendelssohn.

Wherever the Anglo-Saxon race is represented in sufficient numbers, even in the remotest parts of the globe, the club idea has taken root, and we find English-speaking clubs or such as are suggested by or modeled upon English originals. India has more than 140 clubs; Pekin has its Reform Club; Cairo its Cycling Club, and Zanzibar its Golf Club. The Scotch Thistle Club of Hawaii shows its origin in its name and springs from the same source as the Caledonian clubs of America. Indeed, the tendency of men of a common blood to seek, when on a foreign soil, a social bond of unity, accounts for a special type of club. The line between organizations calling themselves societies and those known as clubs, is not always distinctly marked, but in general it may be said that where the social element is slight or lacking, the term club is inappropriate. This element entered largely into organization of many women's clubs in the early history of such societies, but their literary, professional, and especially their philanthropic features have become more prominent of late years. See BOYS' CLUBS; GIRLS' CLUBS; MOTHERS' CLUBS; WOMEN'S CLUBS; WORKINGMEN'S CLUBS.

Club-fingers. See HAND.

Club-foot (Lat. *Talipes*), a congenital distortion of the foot, of which there are several varieties. Sometimes the foot is twisted inward (*T. varus*); sometimes the heel is raised and the toes only touch the ground (*T. equinus*); sometimes the foot is twisted outward (*T. valgus*); or it rests only on the heel (*T. calcaneus*). The deformity consists at first in the contraction of the muscles and tendons of the feet, but ultimately the bones become distorted. If attended to in time, the foot may be gradually coaxed to its natural shape, and even in more advanced cases the deformity is usually curable by modern surgery.

Club-moss, the common name of the *Lycopodiaceæ*, a natural order of the mosses, containing four genera and 110 species, two of which, lycopodium and psilotum, are found in America, and two in Australia only. The club-mosses are found as gigantic fossils in the Upper Silurian, Devonian, and Carboniferous periods, and are a marked feature of the rocks of the two latter periods. See LYCOPODIUM.

Club-root, Anbury, or Finger-and-Toe (*Plasmodiophora brassicæ*). This fungous disease is known under the above common names; it attacks turnips, cabbages, cauliflowers, and allied plants, often seriously injuring the crop. The term "club-root" arose from the club or wart-like excrescences which result from a plant being infested; owing to the tendency of the root to split up in this manner the term "finger-and-toe" is also applied. In Europe these knob-like growths cannot be regarded as conclusive evidence of this disease, as they may be

CLUMBER SPANIEL — CLUVER

due to attacks of a gall insect. This fungus belongs to a very low order known as the slime-fungi; it can readily enter the young host plant, where it grows and reproduces rapidly; by the time the host should be mature, in fall, the fungus has formed millions of spores, which live over winter. The fungus can live for years in the soil, and no means of killing it is known, although applications of lime and potash reduce its ravages considerably. Methods of prevention are advocated, as, keeping the land free from cruciferous weeds, as wild mustard, etc., and destruction of all affected roots by burying with quicklime, or burning.

Clumber Spaniel, a short-legged spaniel averaging from 30 to 35 pounds in weight. Its legs are somewhat bowed, and its feet are large. It is a good swimmer, and is valued for its retrieving qualities, and its silence while hunting.

Cluniacs, or **Congregation of Cluny**. See CLUNY.

Cluny, klü-nē, or **Clugni**, a monastery of that branch of the Benedictine order known as the Congregation of Cluny, or as Cluniacs. It was founded in 912, at Cluny, 15 miles from Macon on the Saone. In the 12th and 13th centuries Cluny was perhaps the most notable monastic foundation in Europe: it had many hundred monasteries under the jurisdiction of its abbot. The first Cluniac house in England was founded by the Earl of Warenne, companion-in-arms of William the Conqueror. The church of the mother, established at Cluny, built in the 11th century, was regarded as one of the wonders of the world: this monument of gothic architecture was at the Revolution secularized by the republican government and was sold to the commune of Cluny, and by them was leveled with the ground. Napoleon, on being invited by the townsmen to visit the place, made reply, "No; you are vandals." There were suppressed by Henry VIII. in England and Wales 35 Cluniac houses, one of them a convent of nuns.

Clupeidæ, kloo-pē'ī-dē, the herring family, fishes of the order *Isospondyli*. The oblong, compressed, or nearly rounded body is covered with usually very thin, delicate, and easily detached cycloid scales, but the head is scaleless; the caudal fin is forked, the dorsal and specially the anal fins, elongated, and the last dorsal ray sometimes thread-like and prolonged. The skeleton is remarkable for the great number of delicate rib-like intermuscular bones; the maxillary bone forms the greater part of the upper jaw, and, like the rest of the mouth, is toothless or provided with only minute teeth; the gill-rakers are usually elongated and numerous, and there is no gular plate or bony piece in the floor of the mouth. There are nearly 30 genera and 150 species now known, most of them marine, but many migrating into fresh water to spawn. North America has 15 genera and 40 species. The most important of all food fishes belong to this family, of which the alewife, herring, shad, menhaden, and sardine (qq.v.) may be named.

Cluricaune, kloo'rē-kôn, in Irish mythology, an elf of evil disposition who usually ap-

pears as a wrinkled old man, and has knowledge of hidden treasures.

Cluseret, Gustave Paul, güs-täv pöl klüz-zè-rā, French officer and Communist: b. Paris 13 June 1823; d. Toulon 23 Aug. 1900. He came to the United States soon after the breaking out of the Civil War, and after serving on Gen. McClellan's staff became a brigadier-general. In 1864 he edited the 'New Nation,' in New York. Subsequently he returned to Paris, and was war minister of the commune in April 1871. From Paris he fled to England and Mexico, and was condemned to death by a military tribunal in 1872. He was, however, pardoned and allowed to return to Paris in 1880, and in 1888, 1889, and 1893 was elected to the Chamber of Deputies.

Cluse, Charles de la, shärl dé lä klüz (CLUSIUS), French botanist: b. Arras 18 Feb. 1526; d. Leyden 4 April 1609. He traveled extensively in Europe in pursuit of his favorite science, and by over-exertion and numerous grave accidents, he ruined his health and became a cripple. He was made keeper of the Botanical Gardens at Vienna, and in 1593 accepted the chair of botany at Leyden. His principal works are: 'History of Rare Plants'; and 'History of Plants,' a translation from Dodoens.

Clustered Column, in architecture, a pier which appears to consist of several columns or shafts clustered together; they are sometimes attached to each other throughout their whole height, and sometimes only at the capital and base.

Clutha, kloo'tha, sometimes called MOLYNEUX, the largest river of New Zealand, in the southern part of the South Island. It receives the waters of lakes Hawea, Wanaka, and Wakatipu, and flows in a southeasterly direction through the counties of Vincent and Tuapeka, and then between those of Clutha and Bruce, till it reaches the sea in Molyneux Bay, after a course of 150 miles.

Clut'terbuck, Captain Cuthbert, the feigned editor of three of Scott's novels: 'The Monastery'; 'The Abbot'; and 'The Fortunes of Nigel.'

Cluver, kloo'vèr, or **Cluverius, Philipp**, German geographer and antiquarian: b. Danzig 1580; d. Leyden 1623. He applied himself first to the study of law, but afterward, against the will of his father, almost exclusively to history and geography. Being on that account left without support by his father, he was compelled to enter the service of the Austrian army, but at the end of two years he returned to his favorite pursuits. He now traveled through England, Scotland, France, Germany, and Italy, and then settled in Leyden, where he gave himself up entirely to literary labors till his death. His first geographical work, 'Germania Antiqua,' was published in 1616. Two carefully prepared antiquarian works, one upon Sicily, Sardinia, and Corsica, the other upon Italy, followed. His most important work was not published till after his death. It is entitled 'Introductio in universam Geographiam tam Veterem quam Novam,' and is the first successful attempt at a systematic treatment of geography in the whole extent of its historical and political relations. The first edition appeared at Leyden

CLUYSENAAR — CNICUS

in 1629, but it has been frequently republished. The most complete edition is that of Bruzen de la Martinière (1729).

Cluysenaar, Alfred, Belgian artist: b. Brussels 24 Sept. 1837; d. there 23 Aug. 1902. He was the son of a noted architect, with whom he at first studied sculpture, but he was more attracted to painting and subsequently studied art in Brussels and Paris, exhibiting 'A Dominican Meditating' in 1861. Other pictures of his are a 'Vocation,' now in the Brussels Museum, and a 'Mazeppa,' and six large mural paintings for the University of Ghent.

Clwyd, kloo'íd, Wales, a river in County Denbigh, rising on the northeast of the Bronbanog, and entering Abergele Bay, after a course chiefly northwest of about 30 miles, during which it is joined by several small tributaries. It is navigable at high water for vessels of 80 tons burden to the town of Rhuddlan, two miles from its mouth.

Clyde, Lord. See CAMPBELL, SIR COLIN.

Clyde, klíd, Scotland, a river which has its sources amid the hills that separate Lanarkshire from the counties of Peebles and Dumfries, flows by Lanark, Hamilton, Glasgow, Renfrew, Dumbarton, Greenock, etc., and forms finally an extensive estuary or firth before it enters the Irish Sea at the southern extremity of the island of Bute. From its source to Glasgow, where navigation begins, its length is 70 or 80 miles. Its principal tributaries are the Douglas Water, the Mouse, the Nethan, the Avon, the Calder, the North Calder, the Kelvin, the White and Black Cart, and the Leven. Near Lanark it has three celebrated falls—the uppermost, Bonniton Linn, about 30 feet high; the next, Corra Linn, where the water takes three distinct leaps, each about as high; and the lowest, Stonebyres, also three distinct falls, altogether about 80 feet. The Clyde, by artificial deepening, has been made navigable for large vessels up to Glasgow, and is the most valuable river in Scotland for commerce.

Clydebank, a police burgh and town of Scotland, in Dumbartonshire, on the north or right bank of the Clyde, about six miles west by north of Glasgow. It is of modern origin, its chief industry being ship-building. Pop. (1901) 18,654.

Clydesdale, a breed of horses named from the valley of the Clyde in Lanarkshire, Scotland. Clydesdales are about 16 hands high, are compact and muscular in build, and have a long, easy stride. They vary in color, being black, gray, brown, or bay, and are used for draft-horses. Specially fine specimens of this breed are found in the eastern United States, in the service of the municipal fire departments of large cities.

Clydesdale, or Paisley Terrier. See DOG.

Clymene, klím'ē nē, the daughter of Oceanus, and mother of Atlas and Prometheus.

Clymer, klí'mér, Ella Dietz, American poet: b. New York. She began her career as an actress in 1872, but in 1881 she abandoned the stage. She has published three volumes of poems: 'The Triumph of Love' (1878); 'The Triumph of Time' (1884); and 'The Triumph of Life' (1885). She was one of the founders of the "Soros" Society, and its president in 1889.

Clymer, George, American statesman: b. Philadelphia 1739; d. Morrisville, Pa., 23 Jan. 1813. He entered mercantile life when a lad and acquired a competence. He was prominent in public affairs prior to the Revolution, and in 1775 became one of the first Continental treasurers. He was chosen in 1776 to succeed a member of the Continental Congress who had refused to sign the Declaration of Independence, to which he promptly affixed his signature, the 38th after John Hancock's. He was active in the patriot cause during the Revolution, was a member of the convention that framed the federal constitution, and in 1788 was elected a member of the first congress under that instrument. In 1790 he declined a re-election, and in the succeeding year was appointed collector of the excise duties on spirits, the collection of which in Pennsylvania led to the whiskey riots. Clymer acted firmly, yet temperately in the troubles, till finding the office distasteful, he resigned it, and was appointed, with Pickens and Hawkins, to negotiate a treaty with the Cherokees and Creeks in Georgia. No man was more averse than he to the assumptions of aristocracy, to the excellencies, honorables, and esquires, who, he said, abounded more in the United States than in any other country in the world. He seldom spoke in public, but when he did his ideas were expressed in language, keen, pithy, and laconic.

Clysters, medicaments introduced into the lower bowel, usually for the purpose of expelling its contents. When used in ordinary cases of constipation a syringe of a peculiar construction, capable of injecting water in a lukewarm state, and either pure or mixed with soap, is often employed with immediate effect; but all kinds of clysters require to be used with moderation, as they have a tendency to impair the energy of the alimentary canal. Enemas are also used to supply nourishment when it is impossible to administer it by the mouth, as in cases of tetanus, spasmodic closure of the œsophagus, etc.

Clytemnestra, klít-ēm-nēs'tra, daughter of King Tyndareus and Leda, and half-sister of Helen. She bore her husband Agamemnon two daughters, Iphigenia and Electra, and one son, Orestes. During the absence of Agamemnon in the war against Troy she bestowed her favors on Ægisthus, and, in connection with him, murdered Agamemnon on his return from Troy, and, together with her paramour, governed Mycenæ for seven years. Her son, Orestes, killed them both.

Clytie, klít'ē, the daughter of Oceanus and Thetis, who pined away through love for Apollo, and was changed by him into a sunflower.

Cnicus (Latin for safflower, which name was first given to the thistle), a monotypic genus of the natural order *Compositæ*. The plant is an annual herb which came originally from the southern part of Europe, and occurs from May to August in waste places along the Pacific coast as well as on the eastern seaboard from Maryland to Nova Scotia. *C. benedictus*, or, as it is sometimes called, St. Benedict's thistle, was formerly used as a febrifuge, but is now rather considered a tonic and diaphoretic.

CNIDUS — COACH

Cnidus, nī'dūs, or **Gnidus**, Asia Minor, a town in the province of Caria, and a favorite resort of Aphrodite (Venus), who was hence surnamed the Gnidian Goddess. She had there three temples. In the first, probably erected by the Lacedæmonian Dorians, she was worshipped as Doritis. The second was consecrated to her under the name of Aphrodite Acræa. The third, called the Temple of the Gnidian Aphrodite, and by the inhabitants, the Temple of Aphrodite Euplæa, contained Praxiteles' marble statue of the goddess, one of the masterpieces of art. This was afterward removed to Constantinople, where it perished in a conflagration in 1461.

Cnossus, nō'sūs, or **Gnossus**, more anciently CNOSUS, or GNOSUS, now MAKRO TEIKHO, the capital of Crete in the time of Minos, was built on the Cæratu, a short distance from the northern coast, and founded by Dorians, who diffused their institutions over the island. Homer mentioned it as already a great city, and the residence of the celebrated Cretan king; it long maintained its preponderance, until it was weakened by the growing importance of Cydonia and Gortyna. It was renowned in mythology by numerous legends of Jupiter, born, married, and buried in its vicinity; of Minos, Ariadne, the minotaur, and the labyrinth. In later times it became a colony of the Romans. Ænesidemus, the skeptic philosopher, and Chersiphon, the architect of the temple of Diana in Ephesus, were born there.

Coach, a large, close, four-wheeled vehicle, generally constructed to carry passengers inside and outside; used for purposes of state, for pleasure, or for traveling. It cannot be determined at what time covered carriages first came to be used, but they were in use among the Romans. The earliest carriages appear to have been all open, if we may judge from the figures of Assyrian and Babylonian chariots found on the monuments discovered amid the ruins of Nineveh and Babylon. At Rome the matrons used to be conveyed on festal occasions in covered carriages called *carpenta*, which was a high distinction, since during the republican period the use of carriages in the city was entirely prohibited. At a later period covered carriages, richly ornamented, were used by the Romans on occasions of state and ceremony. After the fall of the Roman empire they went out of use again, and during the feudal ages the custom was to ride on horseback, the use of carriages being considered effeminate. Although mention is made of them again before the end of the 13th century, they do not appear to have become common until about two centuries later, when, however, they were regarded exclusively as vehicles for women and invalids. But a little later they seem to have been looked upon as appendages of sovereignty, and the German princes vied with one another in the splendor of their equipages, while their use was prohibited to the nobility and their vassals. About 1282 the Queen of Charles of Anjou entered Naples in a caretta, which seems, in some respects, to have resembled a modern coach. In England a kind of carriage called a "whirlicote" was in use in the reign of Richard II.; but coaches, properly so called, are stated by Stow to have been introduced in 1564 by a Dutchman, who

became coachman to Queen Elizabeth. Stow adds:

After a while, divers great ladies, with as great jealousy of the queene's displeasure, made them coaches, and rid in them up and downe the countrie, to the great admiration of all the beholders; but then by little and little they grew usual among the nobilitie, and others of sort, and within twentie years became a great trade of coach-making.

They were, however, for a long period confined to the aristocracy and the wealthy classes. Sometimes six or even eight horses were harnessed to the coach, partly no doubt for the sake of display, but chiefly because the wretched state of the roads required that number. At first coach-wheels were very low, which circumstance also contributed to prevent the attainment of any considerable speed, and to make it necessary to use several horses to draw them; and no one seems to have pointed out the advantages of large wheels until, in 1771, a Mr. Moore for a short time attracted a good deal of attention by pointing out the fact that it was much easier to draw a coach or cart with large wheels than with small ones, and by actually constructing a coach "very large and roomy," which was "drawn by one horse, and carried six persons and the driver, with amazing ease, from Cheapside to the top of Highgate Hill," coming back "at the rate of 10 miles an hour, passing coaches-and-four, and all other carriages it came near on the road." A contemporary account states that this coach had two large wheels, 9½ feet in diameter.

Hackney-coaches were first used in London in 1625. They were then only 20 in number, and were kept at the hotels, where they had to be applied for when wanted. In 1635 an attempt was made to restrain their use by a proclamation of Charles I.; but, this being found unsuccessful, their number was limited, and a commission was given to the Master of the Horse to grant licenses for their use. In this year only 50 were licensed. In 1634 one Capt. Baily, who had formerly been a sea-captain, hit upon the plan of keeping a number of hackney-coaches, with drivers in livery, standing at a particular place (the "Maypole," in the Strand), where they might be had whenever they were wanted. Hackney-coaches now rapidly became more general. The four started by Capt. Baily in 1634 had increased to 200 in 1652, to 800 in 1710, and to 1,000 in 1771.

The following facts relating to the history of stage-coaches are taken from Chambers' 'Book of Days': Stage-coaches were introduced into England about the same time as hackney-coaches. The first stage-coach in London appears to have run early in the 17th century, and about the middle of the same century they appear to have become general both in London itself and in the better highways in the neighborhood. Before the end of the century they were started on three of the principal roads in England. Their speed at first was very moderate, about three or four miles an hour. They could run only in the summer, and even then their progress was often greatly hindered by floods and by the wretched state of the roads generally. In 1700 a week was considered a marvelously short space of time to take to travel from York to London; and even 60 years later a fortnight was spent in going between Edinburgh and London. The first stage-coach

COACH — COAHUILA

that traveled between Glasgow and Edinburgh, which was set on foot in 1749, occupied two days in the journey. The first efforts to accelerate the speed of traveling was made by a body of Manchester merchants in 1754, who started a conveyance to which they gave the name of the "Flying Coach," and which was intended to cover the distance between Manchester and London in the unusually short period of four days and a half. In their prospectus, the proprietors of the new vehicle made the following announcement:

However incredible it may appear, this coach will actually (barring accidents) arrive in London in four days and a half after leaving Manchester.

Thirty years later, Mr. Palmer, of Bath, after a considerable amount of opposition, succeeded in inducing the government to put in practice certain suggestions which he made, by which he showed that great saving both in time and money in the conveyance of passengers and letters would be effected. The result was the establishment of the system of mail-coaches, which continued to be the means of traveling in England until their place was taken by the railways. The first mail-coach started between London and Bristol on 8 Aug. 1784.

The manufacture of elegant coaches is a proof of much wealth and mechanical skill in a place, many different artists being employed in their construction, who become skilful only when the demand for their work is considerable. Brussels was once famous for the manufacture of carriages, and many are built there still. Vienna-made coaches, etc., are also in good repute. See also CARRIAGE; CARRIAGE AND WAGON INDUSTRY.

Coach, or **Dalmatian Dog**, a short-haired dog of moderate size and rather handsome shape, white, with numerous round black spots, kept as an attendant upon carriages, and of no use otherwise, except in some parts of northern Europe, where it is used to draw milk-peddlers' carts and other small vehicles. Although called Dalmatian, the breed is believed to have originated in Spain.

Coach-whip Snake, an American snake (*Masticophis flagelliformis*), characterized by a long, narrow head, projecting upper jaw, superior orbital plates large and projecting much over the eyes; nostrils large, lateral, and near the end of the snout; eyes large, iris dark gray; neck small, body long, and tail attenuated like a whip-cord, which it also resembles in the braided appearance produced by the arrangement and dark border of the scales. The color of the head, neck, and a third of the body is glossy black, becoming paler toward the tail, which is tawny brown; the scales of the tail have dark margins; the lower surface in front is bluish slate, behind white clouded with brown; the colors vary in their shades, but near the head it is always black. They sometimes attain the length of seven feet. It moves with great swiftness, and feeds on young birds and small animals; though inoffensive to man, it defends itself bravely, twining its long folds around its enemy. The species is rare, and appears to be confined to South Carolina, Georgia, and Florida. In its general form, in the scales, and in the plates on the head, it somewhat resembles the black snake.

Coadju'tor, a Latin term, nearly synony-

mous in its original meaning with assistant, and applied by the Romans to a kind of deputies or lieutenants given to magistrates to assist them in a press of business, or supply their place in absence. The term was afterward introduced into the Church and given to persons who were associated with prelates, archbishops, or bishops, to assist them or act as substitutes for them in the discharge of their functions. The appointment usually made the coadjutor the successor of his principal, and in this way great abuses arose. At first the coadjutor was nominated by the king on the presentation of the archbishop or bishop with whom he was to be associated, and who generally took care to present some nephew or cousin, who had been or was about to be ordained, and thus the highest ecclesiastical positions became in a manner hereditary in a certain number of families, contrary to the ecclesiastical maxim which declared them to be purely elective. The abuse once begun made rapid strides until the Council of Trent introduced several reforms, by providing that the nominations of a coadjutor should not take effect except in cases of necessity or manifest utility, the Pope being made sole judge of these cases. Coadjutors, as now understood, are of two kinds, one temporary and revocable, allowed on account of illness or other incapacity, and allowing no right of succession; the other irrevocable and carrying with it the right of succession. The Council of Trent did not favor the "irrevocable right of succession," but the Pope grants it in special cases. A coadjutor differs from a "suffragan," and the words have slightly different meanings in different countries. The term and the office is not confined to the Roman Catholic Church; it is in use also in the Anglican Church.

Coagula'tion (Latin, "to curdle"), the peculiar change from the state of a liquid to that of an amorphous solid, exhibited, under certain conditions, by proteid bodies and their solutions. The hardening of an egg by boiling is a familiar instance of the process. In this case the change is induced by heat, and begins when the temperature reaches 160° F. or thereabouts. Another familiar case is the clotting of blood, which occurs from a very different cause. The blood contains two albuminous substances which are concerned in the phenomenon, and which are known respectively as "fibrinogen" and "fibrinoplastic substance." These are normally held in solution; but as soon as the blood is removed from the body they undergo a change whose nature is not well understood, the product of which is a stringy, elastic, fibrous or jelly-like solid known as "fibrin." In the pure state fibrin is white or gray, but in the blood-clot it appears strongly red, because its fibres imprison multitudes of the red corpuscles of the blood unless special care is taken to prevent this action. Casein, the principal proteid constituent of milk, does not coagulate from the direct application of heat, but it coagulates very quickly when rennet is introduced, and it also coagulates spontaneously under the influence of certain of the products of fermentation that develop in the milk after it has been exposed to the air for a time.

Coahuila, kō-ä-wē'lä, Mexico, a state bounded on the north by the United States, on the east by Nuevo Leon, on the south by San

COAITA — COAL

Luis Potosi and Zacatecas, and on the southwest, west, and northwest by Durango and Chihuahua. Its area is about 60,000 square miles. The capital is Saltillo. The principal mountain ranges are in the districts of Rio Grande and Monclova. Besides these we may mention the Sierra Madre, in the Saltillo district; the Sierra Paila, in Parras; and Sierra Noas, in Viesca. The rivers are: Rio Grande (also called Rio Bravo), forming the boundary line with Texas; the Sabinas, forming the boundary between the districts of Monclova and Rio Grande; the Alamos, Monclova, Patos, Saltillo, Aguanaval, Nazas, and their tributaries. The principal lagoons are those in the districts of Parras, Viesca, and Monclova. Extending from the foot of the mountains northward are sterile plains, where the heat is intense; to the southeast lies the Laguna region, fertile and temperate; the mountainous district, rich in minerals, has frequent frosts. In general the climate is not healthful, the most common diseases being malarial fevers, typhus, rheumatism, and affections of the respiratory and digestive organs. Mining has recently become one of the chief industries. Silver, lead, coal, iron, copper, and gold are found. The first position, however, is still held by agriculture. Cotton, corn, wheat, sugarcane, etc., grow readily; and grape-culture is attracting special attention. The grapes of Parras are considered by some experts equal if not superior to the Malaga and Granada varieties. The state's output of cotton in 1897 was valued at \$6,264,632. The value of ixtle produced in the same period was \$2,430,338. Cattle-breeding is carried on quite extensively. The export trade is principally with the United States, to which, among other products, are brought ixtle and its various manufactures. The commerce of Coahuila is in the hands of Americans, Spaniards, Germans, and Frenchmen; its total trade is of the estimated value of \$11,000,000, or \$12,000,000, silver, per annum. Manufactures are: cotton and knitted goods, wines, tanned skins and hides, soap, candles, cheese, shoes, molasses, furniture, pottery, carriages, wagons, and chocolate. The railroad system includes a number of important lines. There are good wagon roads; also telegraph and telephone service and an efficient mail-service. The state is divided into five districts, subdivided into 33 municipalities. Pop. 285,000.

Coaita, kō-ī'ta. See SPIDER-MONKEY.

Coal. No suitable definition of the mineral substance called coal exists. Such a definition as «anything dug out of the ground that will burn» is obviously too loose; at the same time a definition based strictly on chemical composition is of slight value, since coal is a very complex substance and good coals vary greatly in composition. Generally speaking, coal is believed to represent the remains of various kinds of plants. It is found in seams or beds, separated by other beds or strata of clay, shale, grit, or sandstone. Inasmuch as all plant life depends on the energy received from the sun, and as, through the sun's rays, plants are enabled to fix in more or less stable form the carbon of the carbon dioxide from air and soil, it is permissible to define coal as buried sunshine. Such a definition at least indicates the great source of the

energy given off as heat and light from a coal fire.

Origin.—Many theories have been advanced as to the origin of coal. Thus coal beds have been attributed to the drying up of petroleum lakes on old land surfaces, to the separation of carbon by some fanciful chemical process from limestone, and to accumulation of seaweeds along old ocean beaches. These theories may be dismissed without discussion; they may help explain some particular instance, but are so unsupported by facts that they are of no wide application. The generally accepted theory applies to practically all kinds of coal deposits and is, briefly, as follows:

When the woody material, cellulose, of the leaves and stems of plants, falls on the ground, it soon oxidizes or decays, and the oxygen, hydrogen, carbon, and nitrogen present pass into the air or soil as gases, the hydrogen and oxygen chiefly as water vapor, the carbon as carbon dioxide, and the nitrogen as ammonia. Finally of the original material, say the trunk of a great tree, only the ash, composed chiefly of silica, alumina, and iron oxide, is left. Thus it happens that the leaves, twigs, and branches that have fallen for thousands of years in a forest are represented by a few inches of vegetable mold or humus, plant substance not yet oxidized to ash. If, however, the ground be covered by water, as in a swamp, air is partly excluded, and decay proceeds so slowly that vegetable or animal remains may be preserved for long periods of time. Still oxidation goes on: the dead plants gradually give up their hydrogen, oxygen, and carbon as water, marsh gas, and carbon monoxide and dioxide, and change to a mass of partly decayed vegetable fibre or even to a black muck.

A damp climate and a land surface from which the rainfall runs off slowly, favor the formation of extensive swamps, though in a climate as damp as that of Ireland peat bogs climb hillsides, the mosses (*Sphagnum*), the chief plant growth in such swamps, dragging up water by capillary action. On the plains of Alaska and Siberia, where the ground is permanently frozen, mosses cover the ground with a thick mat, and such swampy plains are called tundras. In a lake country can be found areas which a little investigation shows were at no very remote date covered by shallow bodies of water, but are now swamps, the original lakes having been filled by the dead mosses, rushes, and other aquatic plants. Along the seashore in a region of average rainfall, where the coast is of low relief and the rivers sluggish, sand-bars form by wave action off shore, and behind these bars are salt lagoons and marshes, changing, farther from the ocean, to brackish, and finally fresh-water swamps.

Fresh or brackish water and a fairly warm though not torrid climate are indicated by the fossils of plants and animals found in or near coal seams. From these facts and from the vast extent of some coal fields it is believed that coal beds represent old coastal swamps, possibly of the type of the Dismal Swamp in Virginia. Now if we suppose such a swamp-covered coast to

COAL

sink slowly, the encroaching ocean would cover the accumulated peat and muck with sand and silt until finally the swamp might be buried thousands of feet by sediments from the receding land surface. Instead of steadily sinking, however, the probabilities are that during the great coal-forming epochs the land alternately sank and rose through thousands upon thousands of years, and thus one swamp was buried over another, resulting in those alternating beds of coal, shale, and sandstone characteristic of all coal fields.

The progressive diminution of hydrogen and oxygen compared with carbon is shown by the following table from Percy's 'Metallurgy,' in which carbon is taken at the constant amount of 100:

	Carbon	Hydrogen	Oxygen
Wood	100	12.18	83.07
Peat	100	9.85	55.67
Lignite	100	8.37	42.42
Welsh bituminous	100	4.75	5.28
Pennsylvania anthracite	100	2.84	1.74

The loss of water and of combined carbon, hydrogen, oxygen, and nitrogen, in the change from peat to coal, caused a great loss of bulk. The pressure of overlying strata, or of those earth movements that warp and fold the rock formations, reduced the bulk still more. Thus it can happen that a coal seam one foot thick may represent what was 50 feet of peat in the ancient swamp, and it is fair to assume that an average seam of true coal is not one fifth the thickness of the original peat beds.

Some geologists have believed that when the old swamps now represented by coal seams were accumulating thick beds of peat, the climate was torrid, while the earth's atmosphere contained a higher percentage of carbon dioxide than now. It may be said, however, that a torrid climate is not necessary for the existence of great swamps; and as to a higher percentage of carbon dioxide in the air, were the present land surface of the globe covered with a layer of coal one foot thick, the carbon contained therein, if restored to the atmosphere, would mean an increase in the amount of carbon dioxide of but about .5. This about represents the difference between air in the city and in the country, and the effect of such an increase in stimulating plant-growth is at best doubtful.

As to the age of the coal formations it may be said that true peat deposits are all of later age than the Tertiary, and in North America only peat and incoherent lignite occur in later formations than the middle Tertiary (Miocene) though the early Tertiary (Eocene) formations contain great areas of lignite. In Europe there are lignitic deposits in the Triassic and in the Carboniferous. The great coal-forming age in North America and in Europe was the Carboniferous, though true coals occur in the Permian and in the Triassic, and in North America there are very important coal fields of Cretaceous age. Isolated pockets of coal, but

no workable coal fields, occur in pre-Carboniferous formations. See CARBONIFEROUS SYSTEM.

An idea of the relative compositions of peat, lignite, and true coals may be had from the following table:

	H ₂ O	C	H	O	N	S	Ash
Condensed peat..	20	47.2	4.9	22.9			5.0
Lignite, Alaska..	16.52	55.79	3.26	19.0	.61	.63	4.18
Bituminous coal, Connellsville, Pa.	0.89	82.48	4.50	5.61	1.45	.94	34.1
Anthracite coal, Lykens, Pa....	0.73	82.89	4.53	.40	.64	.68	10.13

Varieties of Coal.—Various elaborate schemes of classifying coal have been advocated, but have not gained popular acceptance. In fact in the coal trade in this country the word coal is often applied to a true lignite. However, since the chief heat-producing element in coal is carbon, a classification in wide use is based on the value of the coal as fuel; that is on the percentage of carbon present and the condition of the carbon.

Part of the carbon is fixed, that is, cannot be driven off by heating in a retort; part is combined with the hydrogen and nitrogen as volatile hydrocarbon compounds which can be driven off. The percentage of fixed carbon is highest in anthracites, but even the semi-graphitic anthracite of Rhode Island contains a considerable percentage of hydrocarbons. The proportion of the volatile hydrocarbons to the fixed carbon in a coal is called its fuel ratio. On this basis the distinctions usually made are lignite, bituminous, semi-bituminous, semi-anthracite, and anthracite. Cannel coal, in which the percentage of volatile hydrocarbons is very high, is believed to be of different origin from other coals. It may represent accumulations of seeds, spores, resins, or gums, and possibly of fish remains, in pools in the ancient swamps. Generally speaking, in anthracite the volatile matter is below 6 per cent, in semi-anthracite below 10 per cent, in semi-bituminous between 12 and 18 per cent, and in bituminous above 18 per cent. In cannel coal the volatile matter may be as high as 50 or even 65 per cent.

Lignite, or brown coal, is brown to black in color, though the powder is always brown. It often shows plainly its vegetable origin, containing stems that look like undecomposed wood. The lustre may be resinous or dull; the specific gravity is .5 to 1.5, some kinds floating on water. Lignites burn easily with a smoky flame, generally contain a high percentage of water, crumble easily, and slack to mud on long exposure.

Bituminous or soft coal is black; the powder is black; the lustre may be resinous or dull; the specific gravity is 1.25 to 1.4. It contains less water than lignite and bears transportation better. Bituminous coals are subdivided according to their properties or uses, into coking, free-burning, smokeless, gas coals, etc. Coking coals partly fuse or cake in burning. If low in ash and very low in sulphur they are highly valued for forging and for making coke and gas. The famous coals of the Cumberland region in Mary-

COAL

land are classified as semi-bituminous. In coking coals the less volatile hydrocarbons present, the higher the yield of coke, but in gas coals the more hydrocarbons the better. A good gas coal will give 10,000 cubic feet of gas per ton. Smokeless coals burn with little smoke and are used for domestic purposes and for steam production.

Cannel coal (from *cannyl*, "a candle"), is black or brownish, has a dull lustre, does not soil the fingers, and shows few or no traces of vegetable structure. It grades into bituminous shale. It contains from 40 to 60 per cent of volatile matter, lights readily, burns with a steady flame, and is used as a fuel for open grates, but chiefly for enriching gas made from other coal. It is mined in the United States at Cannelburg, Ind., and in the Jellico district, Ky.

Anthracite, called also hard coal, is black with a black powder and does not soil the fingers. The specific gravity is 1.3 to 1.75. It kindles slowly, but, owing to the high percentage of fixed carbon, burns without smoke and gives an intense heat. It was formerly much used in this country for smelting iron and is still used as a steam fuel, but its chief use is for household purposes.

Generally speaking, the less water, ash, and sulphur in a coal the better. The water must be evaporated before the coal burns, ash represents inert matter, and sulphur is objectionable for several reasons. A first-class coal should not contain over 6 or 7 per cent of ash and a good gas coal should have less than .7 per cent sulphur.

The following table gives the composition of some representative American lignites and coals:

	Water	Volatile Hydrocarbons	Fixed Carbon	Fuel ratio	Ash	Sulphur
LIGNITE						
Coal: Inlet, Alaska	11.59	49.03	31.64	.64	7.73	....
Coos Bay, Ore....	9.56	49.85	35.98	.74	4.61	.94
Rock Springs, Wyo.	6.98	34.42	52.60	1.53	2.00	....
Boulder, Colo.....	21.37	33.38	40.31	1.21	4.95	....
BITUMINOUS						
Roslyn, Wash.....	2.05	33.55	54.55	1.63	6.85	.11
Trinidad, Colo....	4.88	36.25	53.57	1.48	5.30	....
McAlester, I. T....	2.08	37.52	56.02	1.49	4.38	.80
Saginaw, Mich....	5.82	39.79	45.15	1.13	9.24	3.83
Brazil, Ind.....	13.82	35.16	49.96	1.42	1.06	1.47
Pana, Ill.....	1.94	36.59	58.32	1.59	2.24	.90
Clearfield, Pa.....	.55	25.19	71.02	2.82	2.65	.58
Connellsville, Pa...	1.26	30.11	59.61	1.98	8.23	.78
Pratt Seam, Ala...	1.00	32.17	63.37	1.97	3.34	1.04
SEMI-BITUMINOUS						
Spadra, Ark.....	1.11	11.28	72.84	6.46	12.04	2.74
Pocahontas, W. Va.	1.68	17.45	75.90	4.35	4.20	....
Cumberland, Md...	.96	19.14	72.71	3.80	6.41	.79
SEMI-ANTHRACITE						
Crested Butte, Col.	.72	7.62	87.51	11.48	4.15	....
Bernice, Pa.....	1.29	8.10	83.34	10.28	6.23	1.03
ANTHRACITE						
Cerillos, N. M.....	2.90	3.18	88.91	27.96	5.21	....
Wilkesbarre, Pa...	2.49	4.34	83.97	19.33	8.55	.65
Lehigh, Pa.....	1.72	3.52	88.00	88.49	5.66	.61

Coal Fields of the World.—North America, Europe, and Asia contain the great coal fields of the world. In southern Africa, in Australia, and in New Zealand are deposits of importance. Only small and disconnected areas are known in South America and the only mines worked on a large scale are in Chile. As to Asia, the coal fields of China

are vast and of great promise but are still practically undeveloped. Coal is abundant in India and Burma and the output is increasing fast, particularly from the mines in Bengal. The rather small coal field of Japan is being opened rapidly. The chief coal-producing States of Australia are New South Wales and Queensland. The South African mines are in Cape Colony, Natal, and the Transvaal.

Great Britain long led the world in coal-production, but was passed by the United States in 1899. The important coal fields of Great Britain lie in southern Scotland, stretching with interruptions, from the coast of Ayr to the mouth of the Firth of Forth; in the north of England, in Durham and Northumberland counties; in central England, where the several fields worked include parts of 10 counties, the most important being Yorkshire and Lancashire; in the west of England, near Bristol, and in the Forest of Dean; and the very important South Wales field in the counties of Monmouth (England), and Glamorgan and Carmarthen (Wales), this field producing the best coal mined in Great Britain.

On the continent of Europe, France, Belgium, Russia, Austria-Hungary, and Spain have coal fields of more or less importance. The French coal fields may be grouped in three divisions, those of the north, of the centre, and of the south. The northern field, in the departments du Nord and Pas de Calais, extends into Belgium. The fields of central France are generally small and irregular, the most important being in the department of the Loire. In the south of France the coal fields of Alais and of the Aveyron are of some importance. The coal field of Belgium is a narrow belt extending across the country, except for a short interruption, from the Pas de Calais in France to the Aix-la-Chapelle coal field in Prussia.

Of the German states, Prussia has the largest and best coal fields. These include the Aix-la-Chapelle and the Eschweiler; the very important coal fields of the Ruhr, or of Westphalia; and, extending into Bavaria, the Saarbrücken field, perhaps the most remarkable in Europe for the number of seams and total thickness of coal. In the extreme southeast of Prussia are the important and comparatively undeveloped coal fields of Silesia at the head waters of the river Oder. Of the other German states, Saxony is a considerable producer of coal, the most important mines being near Zwickau.

In Austria-Hungary, coal fields extend from Lower Silesia into Bohemia, and from Upper Silesia into Moravia, with mines near Schlan, Radnitz, and Pilsen. There are also great deposits of lignite, extensively developed near Einbogen and Bilin, and valuable mines of lignitic-bituminous coal near Fünfkirchen in southern Hungary and about Syria and Carinthia in the Austrian Alps.

The most important coal field of Russia is the Donetz basin, between the Don and the Dnieper rivers. It covers a large area and is being developed steadily. Spain has several coal fields, one of some importance in the Asturias, and two others but little developed. Lack of railroads has prevented their exploitation.

COAL

North America, as noted before, surpasses all the continents in the extent and variety of its fuel supplies. The United States leads the world in coal production, and there is little prospect of any country surpassing it before that far distant day when the great coal fields of China are well opened. Canada has coal fields of importance near Pictou and on Cape Breton Island in Nova Scotia, known as the Acadian coal field; also a vast and but partly developed field of lignite and true coal in Alberta and eastern British Columbia, and another field on Vancouver Island. Alaska has no true coal, but workable beds of lignite occur on the coast and in the Yukon valley at Rampart and Circle City.

The Mexican coal fields are of much local importance, but are not likely to produce any coal for export. The principal field is in the State of Coahuila, extending from Eagle Pass to Sabinas. Coal seams have been worked in Sonora, Hidalgo, and Michoacan.

The following table showing the production of coal and lignite of the chief coal-producing countries of the world is compiled from figures published in the 'Engineering and Mining Journal':

Country	Pro-duction	Country	Pro-duction
United States..	293,298,550	Belgium	25,090,490
Great Britain...	245,321,708	Russia	17,929,320
Germany	166,117,978	Japan	8,265,000
Austria-Hun- gary	43,363,700	India	7,840,000
France	32,590,691	Canada	7,630,255

The above figures are for the years 1902 or 1901, and are short tons (2,000 pounds).

The United States, Great Britain, and Germany together produce over 80 per cent of all the coal mined in the world.

The coal fields of the United States, not including Alaska, are of various ages from the Carboniferous to the Eocene, the two great horizons being the Pennsylvanian of the Carboniferous, and the Laramie of the Cretaceous. The total area covered by possibly productive seams of lignite, bituminous coal, and anthracite is fully 250,000 square miles.

For convenience the coal fields may be grouped in these divisions: the Appalachian, covering 70,800 square miles; the eastern interior, 58,000 square miles; the northern interior, 11,300 square miles; the western interior, 94,000 square miles; the Rocky Mountain, 43,600 square miles; and the Pacific coast, 1,050 square miles.

The Appalachian field extends from near the New York and Pennsylvania state line southwesterly through the western half of Pennsylvania and eastern Ohio, the western end of Maryland, the extreme southwest of Virginia, nearly the whole State of West Virginia, eastern Kentucky, and Tennessee, into north-central Alabama. This field is of Upper Carboniferous Age, and with it are included the very important anthracite fields of eastern Pennsylvania, and a small area of graphitic anthracite in Rhode Island and southern Massachusetts. There are also coal beds of Tertiary Age (Newark) in the Rich-

mond basin, near Richmond, Va., and on the Dan and Deep rivers in North Carolina. The Richmond field, though the first to be worked in the United States, having been opened in 1750, is now almost abandoned. The Chetham mines in Durham County, N. C., are of some importance.

The anthracite fields of Pennsylvania are divided for convenience into the northern, or Wyoming, lying in or near the valleys of the Lackawanna and Susquehanna rivers from Carbondale to Shickshinny; the Lehigh, comprising several basins about Hazleton and part of the Panther Creek valley; and the Schuylkill. The last really includes several fields extending from near Mahanoy on the north to Pottsville on the south, and from Tamaqua on the east to Lykens on the west. The total area of the various anthracite basins is about 480 square miles. The coal was mined first about 1765, and at the rate at which production is increasing the estimated life of the field is about 50 years. However, as mines go deeper, and mining costs increase, the resulting higher prices for coal will probably restrict consumption, and with a declining output it is possible that the anthracite mines may not be wholly exhausted in 200 years.

Owing to the competition of lower-priced bituminous coal in the form of coke, the use of anthracite for smelting iron has declined greatly of late years, and its consumption for industrial purposes is not increasing. For steam-production only the small sizes, pea, wheat, buckwheat, and rice, are much used, and these chiefly on railroads running through the fields or in cities having strict smoke ordinances. Anthracite, being clean, smokeless, having great heating power, and burning slowly, is chiefly used for household purposes and is sent to market broken into lumps of several sizes, known as broken or grate, egg, stove, and chestnut, these being called prepared sizes, in distinction from the small or steam sizes before mentioned. The market supplied by the Pennsylvania mines is along the Atlantic seaboard from Nova Scotia to Georgia, also a narrow strip of country extending from Montreal westward through southern Ontario and the States of the Union bordering on the Great Lakes. The chief markets are in New England and in New York, New Jersey, Pennsylvania, and Illinois. Out of a total shipment of 47,665,203 long tons in 1899 it is estimated that 7,144,131 tons went to the New England States, Massachusetts taking half the amount; 12,503,896 tons to New York; 4,693,500 tons to New Jersey; 13,803,253 tons to Pennsylvania; and 2,188,294 tons to Illinois. The total exports of 1,707,796 tons went almost wholly to Canada.

The bituminous coals of the Appalachian field include gas, coking, and steam coals of the highest grade. The largest and best seams or those most easily opened have been exploited so far, and the resources of the Appalachian field are still enormous. The State of West Virginia alone is estimated to contain more workable coal than the whole of Great Britain. The best-known of the various areas now opened are the Clearfield, in Pennsylvania, producing coking, gas,

COAL GAS — COALITION

and steam coals, shipped largely to seaboard points; the Broad Top, in Pennsylvania, producing coal of rather better grade, shipped to the same markets; the Cumberland, in Maryland, producing a famous steam and smithy coal, shipped to the seaboard and to interior cities from Canada to the Rocky Mountains; the Pittsburg, in Pennsylvania, whence come gas and steam coals largely used locally, but also shipped to points on the Great Lakes and on the Ohio River and lower Mississippi; the Connellsville, in Pennsylvania, yielding coal used chiefly for making a standard grade of coke; the Hocking Valley, in Ohio, whence are shipped steam coals to near-by cities and to distant ports on the Great Lakes; the Kanawha, in West Virginia, shipping gas and steam coal to various points on the Great Lakes or on the Ohio River and lower Mississippi; and the New River, Flat Top, and Pocahontas fields in West Virginia, producing steam, gas, and coking coals of varying excellence, the best grades having no superior, which are shipped mostly to seaboard points, though an increasing tonnage is made into coke to supply blast furnaces at Pittsburg, Chicago, and various Ohio cities. In eastern Kentucky is the Jellico field, whence gas and steam coal is shipped to a wide territory, including seaboard cities, and in eastern Tennessee are several basins yielding gas, steam, and coking coals, used locally and shipped to compete with the Jellico coal. The important district in Alabama is about Birmingham: the coal is shipped to Atlantic and Gulf ports for steam- and gas-making, and a large proportion of the output is made into coke for use in local furnaces and foundries.

The eastern interior field covers western Indiana, nearly the whole State of Illinois, and part of Kentucky. The coal is of Carboniferous (Pennsylvanian) Age, but in general lies in thinner veins and is of poorer quality than that of the Appalachian field. Most of the output is used as a steam fuel by railroads and in the many manufacturing cities that lie in or near the field. Certain grades are much used as a household fuel. The field contains no first-class coking coal.

The northern interior field covers a large area in the southern peninsula of Michigan and has been opened chiefly by the mines near Bay City and Saginaw. The seams are comparatively thin, and the coal is generally of poorer quality than that of Indiana and Illinois. The output is used locally. The beds are of Upper Carboniferous Age.

The west central field extends from western Iowa across western Missouri, northwestern Arkansas, and eastern Nebraska and Kansas, through Indian Territory into Texas. The coal beds vary widely. In parts of the field the coal is barely more than lignite, while in northwestern Arkansas it approaches semi-anthracite. The markets supplied cover a great area. Fully half of the output is used by railroads, and of the other half at least 40 per cent is used for household purposes. The measures are Carboniferous.

The Rocky Mountain field includes the numerous disconnected areas lying in narrow belts along either flank of the range from the Canadian frontier southward for 1,000 miles;

Montana, Utah, Wyoming, Colorado and New Mexico having mines. Along the flanks of the mountains and in the parks or plateaus in the main range the coal is largely bituminous; but eastward from the range the coal measures, which are of upper Cretaceous (Laramie) Age, are lignitic, and vast beds of lignite underlie the plains of Montana, Wyoming, and North and South Dakota. The mines now opened supply the great trans-continental railroads, the chief users. In places the coals make good coke, used by local smelting plants. The resources of the field are vast and but little developed.

The Pacific coast coal field is of Tertiary Age and most of the output is lignite. It includes some unimportant basins in California, several fields in Oregon, of which the Coos Bay has been most developed, and the Roslyn and Puget Sound fields in Washington, the former producing a good bituminous coking coal. The California and Oregon fields are of little more than local importance, but the Washington mines supply railroads and steamships and are an important factor in the coal trade of San Francisco.

The rank of the principal coal-producing States of the Union is shown by the following table compiled from figures published in the 'Engineering and Mining Journal.' The figures are for 1902, except that for Pennsylvania the 1901 figures are taken, owing to the anthracite output in 1902 being curtailed by a long strike of the miners. The figures given include coal and lignite:

States	Short Tons	States	Short Tons
Pennsylvania ..	149,777,567	Kansas	5,379,500
Illinois	31,000,000	Wyoming	4,900,000
West Virginia..	26,162,173	Tennessee	4,800,000
Ohio	24,700,000	Maryland	4,565,311
Alabama	10,327,713	Missouri	4,250,000
Indiana	8,357,417	Virginia	3,100,000
Colorado	7,522,923	Indian Territory	3,000,000
Kentucky	6,421,266	Washington ...	2,690,789
Iowa	5,800,000	Arkansas	2,200,000

It will be seen that Illinois already produces about as much coal as France, and West Virginia produces more than Belgium. The production of Pennsylvania in a few years bids fair to equal that of Germany.

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Coal Gas. See GAS ILLUMINATING.

Coal Gas Poisoning. See CARBON-DISULPHIDE; COAL MINING; ILLUMINATING-GAS POISONING.

Coalition, The, in political history. (1) ENGLISH. In 1783, after the American War, there were three parties in Parliament, neither able to stand alone. The weakest (C. J. Fox "conscience" Whig) joined the second (Lord North, Tory), ousted the strongest (Lord Shelburne, opportunist Whig), and the coalition tried to pass an India bill with self-perpetuating offices. Fox had long denounced both North and George III. without stint personally as well as politically, and was a chief agent in debauching the Prince

COAL MEASURES — COAL MINING

of Wales (afterward George IV.); and the king was furious alike at his accession to power and North's ingratitude. As the two statesmen had professed utterly irreconcilable basic principles, the people were equally disgusted with what seemed a grossly corrupt bargain for the sake of office — though a different view is now taken. The king killed the India bill by threatening the Lords, dismissed the Coalition ministry, and made the younger Pitt premier; at the next election the Tories received an overwhelming majority. remained in power many years, and the name "Coalition" was long the most unsavory of bywords. (2) AMERICAN. In 1824, there being no electoral majority for President, the smallest (Henry Clay) party joining in electing the head of the second (J. Q. Adams); the largest (Andrew Jackson) considered this defeating the popular will, and when Adams later made Clay secretary of state, declared it to be in pursuance of a corrupt bargain, and gave it the name of the ill-savored Fox-North Coalition. The nickname was used for many years with damaging effect, though perfectly irrelevant, as the Clay and Adams parties were in close sympathy politically, and their heads not hostile personally. The Clay men much preferred a trained and gentlemanly statesman like Adams to one whom they regarded as an ignorant and violent demagogue, and Clay's position and ability entitled him to the place, which other great party leaders (Blaine, for example) have held later.

Coal Measures. See COAL; CARBONIFEROUS SYSTEM.

Coal Mining. Coal mining differs from metalliferous mining chiefly in the better ventilation required, the extent and regularity of mine workings, and the necessity of getting out the mine product with as little dust as possible. The principal gases found in coal mines are carbon dioxide, CO_2 , heavier than air, suffocating, but not inflammable, called choke-damp by miners; carbon monoxide, CO , about as heavy as air, poisonous and inflammable, the dreaded white-damp of the miners; carburetted hydrogen, CH_4 , light, not poisonous, but inflammable, the chief constituent of fire-damp; also, but less important, sulphuretted hydrogen, poisonous and inflammable, but easily detected by its odor. Of these gases, marsh gas, given off in large quantities in some mines, is the chief agent in coal-mine explosions. A mine is said to be fiery when the coal-seams give off much fire-damp. Many of the deeper coal-mines of Great Britain, France, and Germany are very fiery. The most fiery mines in the United States are in the anthracite region of Pennsylvania, the South Wilkes-Barre shaft at Wilkes-Barre being one of the most fiery mines in the world. A mixture of marsh-gas and air in certain proportions explodes violently on contact with flame. Coal-dust in the air makes a much smaller proportion of marsh-gas an explosive mixture.

To enable men to work in places where sufficient air to carry away the gas does not circulate, or to enable them to work in very fiery mines, safety-lamps are used. In a safety-lamp the flame is enclosed by wire gauze and cannot ignite gas in the air outside the gauze, unless the gauze is heated to the combustion point of the gas. The safety-lamp was invented by Sir Humphry Davy in 1815 and has been improved

in various ways. Many patterns are in use; one of the latest types used in Pennsylvania and Germany is known as the Wolf lamp. The Hepplewhite-Gray lamp is much used in England. A safety-lamp indicates the presence of fire-damp by the lengthening of the flame.

Carbon dioxide and carbon monoxide given off by the coal in place are produced in the mined-out areas known as "gob." These gases are the chief constituents of after-damp, the gases resulting from an explosion of dust or fire-damp. They, rather than the shock, cause the terrible loss of life in mine explosions, since men may be killed by carbon monoxide without knowing they are in danger.

Good ventilation is thus a prime necessity in coal mining. It is sometimes secured by a furnace over a shaft, the fire producing a sufficiently strong up-current. But in all fiery mines, and generally in all large mines, large revolving fans, sometimes 35 feet in diameter, are used to circulate the air. The fans may exhaust or force in air (up-draft or down-draft); various types of mine fans are used, but the majority of those in service in Great Britain and at the larger mines in this country are modifications of the Guibal type.

As most coal-seams worked are a few feet thick, but of considerable extent, and as in this country at least, most coal-beds lie flat or dip at low angles, a coal-mine can be opened in a more regular way than a metalliferous mine. Two systems of mining are used — the pillar and room ("board and pillar"), and the long wall. The first, generally used in the United States, consists in taking out various portions of the coal as the work proceeds, from the mine-opening, and the remainder in working back toward the opening. The long wall system, used in certain bituminous districts in the United States, and extensively used in England, consists in taking out all the coal in a long face as the work advances from the mine-opening, the roadways and air-passages being protected by packs or walls. It is best suited for thin coal-seams with weak roofs, while the pillar-and-room system is best suited for thick seams with rock roofs. The two systems grade into each other.

Coal is broken from the face of the seam by the miner under-cutting it with his pick and then putting in a blast strong enough to bring down the coal. Black powder is generally used in this country. Abroad explosives making less flame are required by law in many districts, and in some of the very fiery German mines wedges operated by hydraulic power are used. To blast coal from the solid rock like an ore, though occasionally done in Illinois and elsewhere in this country is wasteful and dangerous. Fine coal is less valuable than lump, and dust greatly increases the danger of an explosion.

To under-cut the coal, machines are sometimes used. Those in general use in this country are of two types: the Harrison, or puncher type, with a reciprocating piston impelled by compressed air, carrying a cutting bit; and the chain machine, having an electrically driven chain carrying cutting teeth. The latter type, though not favored for fiery mines, is probably more used in newly opened mines, than the former. No machines are used in the Pennsylvania anthracite mines. Of the total bituminous coal (225,826,849 tons) mined in the United

COAL MINING

States in 1901, 57,843,335 tons were under-cut by machines.

The coal, when broken down, is roughly sorted by the miner or his helper and loaded into mine cars which are hauled to the main haulage roads by mules. Here the cars from the various gangways are usually made up into trains (or "trips") and hauled to the shaft bottom or the entrance of the mine by a wire rope (tail-rope haulage), by a compressed air locomotive, or by an electric locomotive. Sometimes the cars are attached singly to an endless wire rope like cars on an ordinary surface cable road (endless-rope haulage). Mines of the shaft type are to be found in largest numbers in the hard-coal districts. The hard-coal mines are likewise the deepest. Occasionally an extreme depth of 1,500 feet is attained. Two other styles of mines are found in both anthracite and bituminous fields,— "drifts" and "slopes." The drift mine is dug straight into the mountain from one side. The passageway or heading may have an upward trend. The slope mine slants downward to the extent of perhaps 35 or 40 degrees, the main heading often measuring a mile or more in length.

Occasionally coal is found in quantities near the surface of the ground. This is true to-day in parts of Missouri. At both Hazelton and Summit Hill, in Pennsylvania, coal has been extracted by an uncovering operation known as "stripping," which is regarded as apart from mining proper. An interesting process also is "pocket mining," but this is practised comparatively little to-day. An outcrop of coal at various points on the side of the mountain suggests the possibility of a rich mineral vein. Digging is begun directly into the bed of coal projecting at the surface. This form of mining is seldom highly profitable, for when the digging has progressed at considerable expense to a point where the mine should be expected to pay, all operations are suddenly cut short by the encountering of solid rock, which, owing to some upheaval of the past, has "faulted" the vein of coal from its natural course. These pockets at intervals in the mountains where pocket mining is done present an interesting sight. About Shickshinny, Pa., they are numerous.

In shaft mines, and especially those of anthracite, mules are used very extensively. Where mechanical power is employed to haul trains in the main haulage-ways, these beasts bring the cars only from the side headings or the rooms. The mules do not see daylight for months at a time. In bituminous drift mines evolution has included the introduction of miniature trolley trains of 40 or 50 cars, each train being in charge of a motorman and brakeman. In anthracite drifts steam locomotives of a small and peculiar type, known as "hogs," haul the trains. In a slope mine cable trains transport the coal. One end of the cable is attached to the train, and the other winds upon a drum at the power-house. When the cable turns a corner it passes around what is known as a "bull wheel." Twenty-five one-ton cars may comprise a cable train of soft coal. Anthracite cars often hold four and a half tons. In soft-coal mines the man in charge of the cable train is called a "rope rider." In bringing his cars out of the mine he sits upon the ring which connects the cable with the train. In the anthracite slopes a

man stands upon the side of a car ready to "sprag" the wheels when a stop is made. Spragging consists in throwing short but stout lengths of wood into the openings between the four spokes of the car wheel. The height of the bituminous vein is often not more than four or five feet, thus making the quarters of the miners rather cramped. In the mining of anthracite only two thirds loosened from the vein is of value. The miner must use good judgment in loading only the paying coal. To handle and transport chunks in which slate predominates is unprofitable. Even the better coal has more or less slate in it, while in bituminous coal the slate is principally at the top and bottom of the vein and not mixed with the product as mined.

Off from the main or side headings of a hard-coal mine "breasts" or "chambers" are opened. In bituminous fields these are known as "rooms." A tunnel or neck 40 to 60 feet long may connect the room proper with the main passageway. Beyond the neck the chamber may broaden out to a width of 30 or more feet, continuing indefinitely. The coal between the rooms forms what is known as a "rib" or "pillar." As the rooms begin to broaden to their maximum widths, timber props are placed between the floors and ceilings to support the loose rock and earth. Apart from supporting the great mass of solid rock, they are of little service.

When all the coal that it is practical to mine in the chambers has been extracted, the work of drawing the ribs between the rooms is begun, eventually allowing the rock above to cave in. In addition to securing the coal in the ribs, this process is necessary, that the weight of the mountain bearing upon the entrance to the mine may be lightened. As mining progresses, the weight is thrown upon the main heading, until, were it not for the drawing of the ribs, this main passageway would close.

When drawing a rib, the soft-coal miner keeps but one car beside him. He cannot tell how much of the rib he will be able to remove before the rock above his head will fall. The first warning of approaching danger is a drumming noise from the layer of stone overhead. Sometimes this noise may be heard hours before the final crash; in anthracite mines it may be perhaps weeks before. Again, it may come with marked suddenness.

The coal, when brought to the surface, is screened, and at many bituminous mines is then shipped as lump and slack. Sometimes it is broken and washed, and in the anthracite region of Pennsylvania, where coal is shipped in seven or more sizes, the coal, as it comes from the mine, is passed through the breaker.

A modern coal breaker built on the side of a hill at Mocanaqua, Pa., will serve to illustrate the construction and operations connected with this important branch of coal-production. This breaker is 300 feet in length and 180 feet in height. It is capable of turning out 1,000 tons of clean coal per day. Some breakers have a much larger capacity. The Mocanaqua breaker was originally built at a cost of \$50,000, but with recent improvements and the installation of the latest machinery its total cost reaches \$100,000. It is heated by steam.

The anthracite is brought to the head of the breaker over a little railway leading from the

COAL MINING MACHINERY

mine in the side of the mountain. The coal, when dumped from the cars, passes over a screen 30 feet in length, through which the fine coal sifts. The big chunks next pass to the breaker proper, where rolls with sharp teeth crush it. It next runs into a screen which is cylindrical in shape, and not unlike a locomotive boiler in appearance. As the coal is handled in this device, it falls through perforations of different sizes, each size dropping into a separate chute. On benches at intervals on these chutes, sit the breaker boys, presided over by a foreman. As the coal passes slowly down the chute at their feet, these lads pick the slate from it and throw the refuse into a parallel chute. The inexperienced boys are always at the upper end of the chutes. They succeed in picking a part of the slate from the coal, and then it passes to the next workmen in line, who continue the operation until, by the time the product has reached the boys at the bottom of the chutes, it is pretty well cleaned. The coal is also washed to free it from dust. From the chutes the various-sized coal finds its ways into bins, from which it is discharged into cars.

Mechanical contrivances for sorting have recently been installed at great cost in modern breakers. These inventions are spiral in shape, and provide for ridding the coal of much of its slate by centrifugal force. But even with these machines the final operation must be performed by boys or men.

A large amount of the soft coal of Ohio and Pennsylvania is brought to the lower harbors of the Great Lakes, bound for the Northwest and Canada. The cars which carry this coal have a capacity of 100,000 pounds, whereas, in the early days of the coal industry in this country, coal cars scarcely carried 1,800 pounds. On reaching the lake ports, coal for Canada may be taken 60 miles across Lake Erie in car ferries. But the bulk of the coal that comes to the lake ports is unloaded directly into the holds of lake vessels by means of most wonderful and massive machines, which pick up a 50-ton car and dump its contents as quickly as a pail of coal could be emptied into the magazine of a stove. Some of these machines can be operated by three men, and yet have a capacity of 500 tons per hour. A large and modern coal vessel will carry a coal cargo of 6,000 tons. The cargo record is 7,800 tons. More than 2,500,000 tons of coal have gone to the head of the Great Lakes in a single season.

Historically considered, coal mining perhaps dates back to about the end of the 12th century. Coal, as an inflammable substance, appears to have been known to the ancients, and to the Britons before the Romans visited their island, it being found frequently in ravines and beds of rivers of a color and texture so decidedly different from the strata which in general accompany it; but as at that period, and for centuries afterward, the country was covered with immense forests, which supplied abundance of fuel for every purpose of life, there was no necessity for using coal as fuel. The working of coal, therefore, only became an object of attention as population and civilization advanced, when agriculture began to be studied, the woods cleared away, and the arts of civil life cultivated; accordingly we find that the working of coal in Great Britain, as an article of commerce, is comparatively of modern date. The

first charter giving liberty to the town of Newcastle-upon-Tyne to dig coal was granted by Henry III. in 1239; it was then denominated "sea-coal," on account of its being shipped for places at a distance. In the year 1281 the Newcastle coal-trade had become so extensive and important that laws were enacted for its regulation. In Scotland coals began to be wrought much about the same time; and a charter was granted in the year 1291 in favor of the abbot and convent of Dunfermline, in the county of Fife, giving the right of digging coals in the lands of Pittencrieff, adjoining the convent. Coal began to be used for iron-smelting about the beginning of the 17th century. The working of coal gradually increased, though on a very limited scale, until the beginning of the 18th century, when the steam-engine was brought forward by Newcomen in the year 1705, and was applied to collieries in the vicinity of Newcastle about the year 1715. This machine produced a new era in the mining concerns of Great Britain, and, as it were in an instant, put every coal-field within the grasp of its owner. Collieries were opened in every quarter; and the coal-trade rapidly increased to an astonishing extent. This extension of the trade was greatly aided by James Watt, who so very much improved the construction and power of the steam-engine as to render it one of the most complete and most useful pieces of mechanism.

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Coal Mining Machinery. Deposits of coal, or coal seams after being opened up by means of shafts, slopes, or tunnels, are worked by either the room-and-pillar, or the long-wall systems. The coal is cut from the seam by hand or by the use of some form of coal-cutting machines. In America, and especially in the United States, the room-and-pillar system is the one most generally used, although modifications of the long-wall method are often employed under local conditions that favor its economical application.

Coal-cutting machines are of four general types — "pick" machines, "chain-cutter" machines, "cutter-bar" machines, and "long-wall" machines. They are operated either by compressed air, or by electricity.

The electric coal-cutting machine consists of three distinct parts — the electric motor and carriage, the outside frame, and the inside or cutter frame. The motor is of the multipolar type, with an iron-clad armature and two field coils. The compressed-air coal-cutting machine differs from the electric machine only in the method of applying the power, a double engine being used instead of an electric motor.

Pick machines are quite similar to the various forms of rock drills. Fig. 1 shows a Jeffrey electric coal drill, designed to be handled by two men. It represents a type of machine

COAL MINING MACHINERY

not extensively used in the past, but which is now being more and more appreciated on account of its economical operation. It consists of a one-and-one-half-horse-power motor wound for practically any direct current voltage and capable of developing a speed of 2,000 revolutions per minute; a feed screw operating

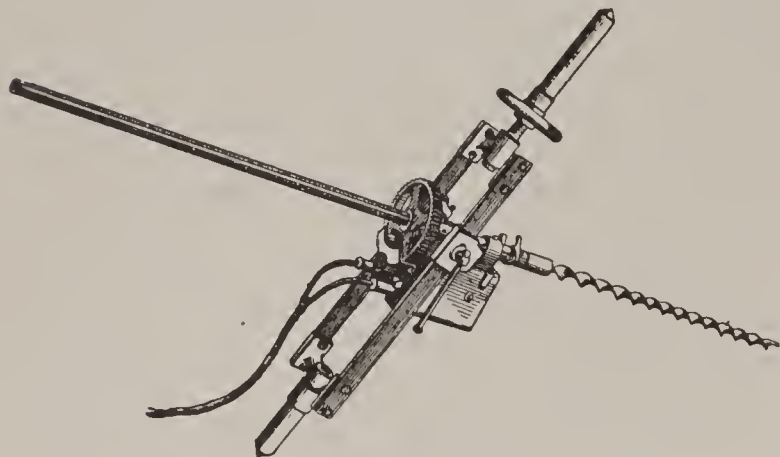


Fig. 1.

at a speed of 360 revolutions per minute; a steel frame made to suit any height of coal; and a drill auger usually ranging from three feet to six feet, but which may be made of any size or length, according to requirements. The total weight of a machine suitable for working a six-foot vein of coal is about 188 pounds. These machines are also arranged to be operated by compressed air, or by hand. The power machines drill in coal at the rate of 6 to 12 inches per minute.

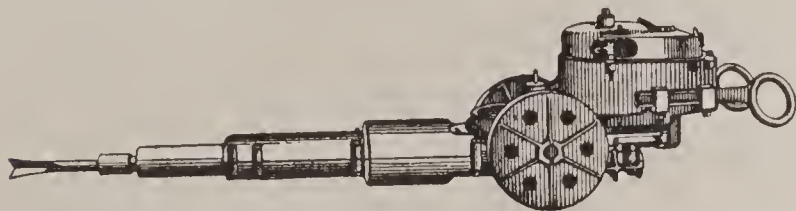


Fig. 2.

Fig. 2 illustrates the general view of a Morgan-Gardner electric pick machine, and Fig. 3, the sectional details of a Sullivan direct-acting undercutter. In these machines a reciprocating piston is actuated by a spring and cam—the spring strikes the blow, and the cam driven by the motor draws the piston back. The number of blows delivered range from 175 to 250 per minute. These machines are used to great advantage in entry driving, cutting necks, and turning rooms, or in any narrow place

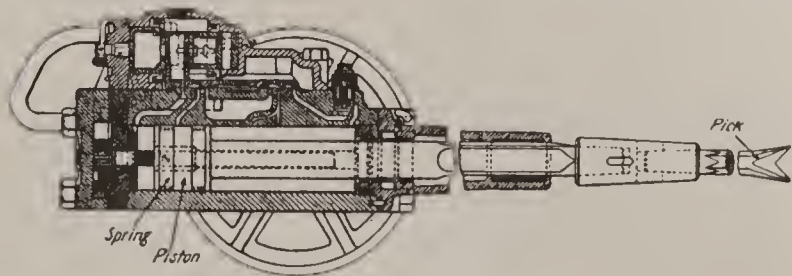


Fig. 3.

where it is difficult to use the chain machines. Operated by two men, one a skilled runner, and the other a helper, they are capable of easily cutting from 50 to 70 feet, $4\frac{1}{4}$ to 6 feet under, per shift of nine hours.

Chain-cutter machines consist of a low bed-frame of metal upon which is mounted a motor that rotates a chain equipped with the cutting

teeth. They are arranged to cut horizontally as in the "breast" machines, or vertically as in the "shearing" machines.

Fig. 4 shows the "Goodman" electric chain breast machine. It consists of a stationary frame which is held to the floor of the mine by jacks at both the front and the rear. Two smooth rails or guides are attached to the motor. The chain runs on the outside of this travelling frame and is equipped with teeth or cutters set at different angles in its links, so that the lowermost of them just clears the floor upon which the machine stands, while the uppermost runs about four inches above the floor. This arrangement cuts a kerf in the coal of sufficient width to allow the travelling frame to enter after the cutters. These cutters are held in the chain by set-screws so as to permit of their being quickly removed and replaced when necessary, an operation very frequently required in cutting hard coal containing sulphur. In operation, the machine is set near the face of the coal with the forward cutters just clearing the same, with the rollers under the rear of the machine set upon a skid, and the front of the machine resting directly upon the floor of the mine. The rear jack is

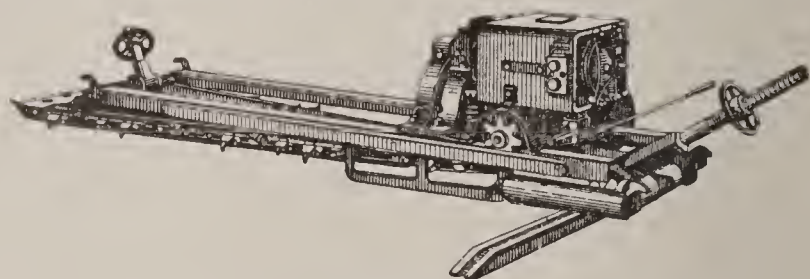


Fig. 4.

set hard against the roof of the mine, and the front jack is set into the face of the coal. Two men are required for its operation—the runner who has charge of the operating machinery, and the helper who places himself near the face of the coal and shovels away the "slack" or machine cuttings as fast as the chain delivers them. The train of gears driven by the motor performs two operations—it carries the cutter chain around the guides or travelling frame, and simultaneously moves the motor and the travelling frame forward upon the stationary frame. This results in the cutting of a kerf about four inches in height and equal in width to that of the cutter head under the coal to a depth of five, six, or seven feet, according to the length of the machine. As soon as the motor reaches the end of the stationary guides, the forward feed is automatically stopped, the runner throws the reverse lever, and the motor travels backwards pulling the travelling frame out of the coal. When the machine is clear of the coal the jacks are loosened, the machine is moved over and the jacks reset in readiness to make another cut. The number of cuts that may be made ranges from 30 to 75 per day of ten hours according to the time consumed in cutting, moving out, and resetting, depending upon the width of the rooms and the character of the roof and face. The power required to operate this class of machines ranges from 10 to 50 amperes at 220 volts, according to the condition of the machine, and the character of the impurities in the coal.

COAL MINING MACHINERY

For cutting in low veins of coal, machines of this class are usually mounted upon self-propelling trucks. The mining machine is arranged with a clutch which can be thrown in and out of gear when necessary. In order to utilize the power of the motor to propel the truck it is thrown out of gear with the cutting mechanism, so that when the machine is moved from one point to another in the mine the only part of the apparatus in motion is that which is necessary to operate the truck. The motor is equipped with a reversing switch which enables the truck to travel in either direction as may be desired. In low veins of coal when the roadways in the rooms are not of sufficient height to allow mules to enter, the self-propelling truck is not only almost a necessity, but greatly reduces the cost of working veins ranging from 24 to 36 inches in thickness.

In a great many coal mining districts the formations are such that the coal is produced in better condition when sheared than when undercut, and there are also cases that require both operations. When shearing a room or entry with machines, it is necessary to raise the machine to the top of the vein where the first cut is made and then to let it down far

is 36 inches in height, 5, 6, or 7 feet in depth, and 4 inches in width. The average cutting capacity ranges from 50 to 100 feet per day of 10 hours.

The long-wall machines are of two types, the "cutter-bar" machine illustrated by Fig. 6, and the "cutter-wheel" machine shown by Fig. 7.

A cutter-bar machine consists of a steel frame finished smooth on one of the long sides so as to slide along the face of the coal. It is supported on the bottom on a steel shoe plate, and carries upon the middle portion a powerful electric motor, the armature shaft of which lies lengthwise of the machine and is geared at one end to a sprocket which drives the "cutter-chain" around a steel "cutter-bar" extending at right angles to the frame. These machines are of the "under-cutter" type, and are capable of making cuts ranging from 38 to 50 inches according to the length of the cutter-bar employed. The cutter-bar is carried on a swinging frame, and by means of a lever can be tilted in its width up or down from the horizontal position to enable the chain to avoid any especially hard substance by cutting over or under the same. A cable-winding drum or

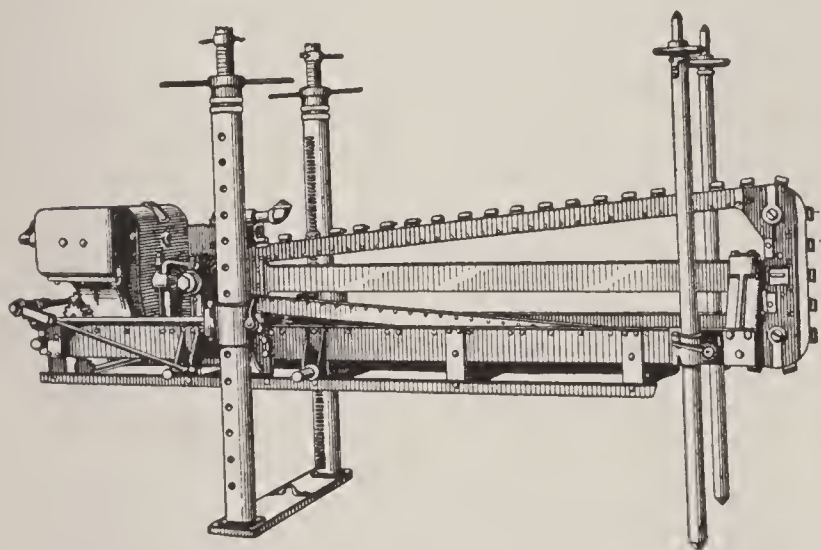


Fig. 5.

enough to make another cut. Fig. 5 shows a Jeffrey electric shearing machine in position ready to cut. It is rigidly supported by two main columns at the balancing point of the structure, to which the frame is tightly clamped, and the front end is steadied by two auxiliary

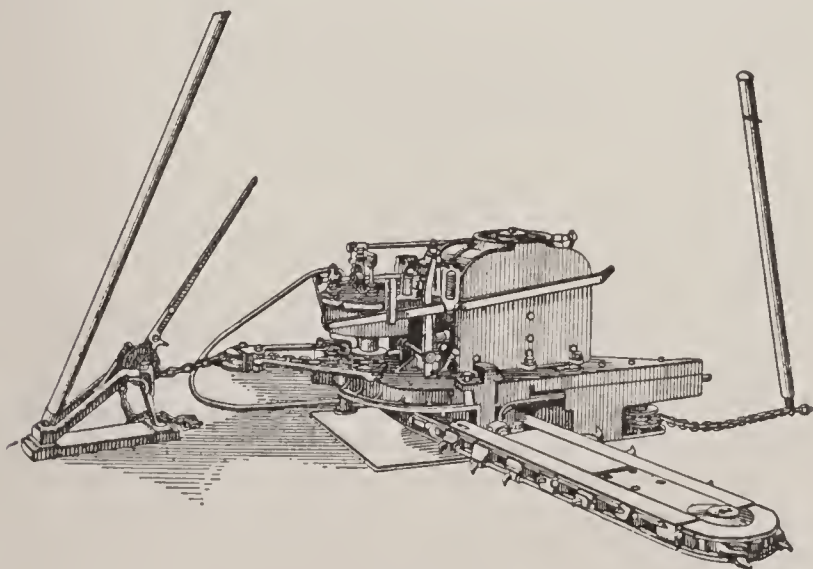


Fig. 6.

columns. The cutting capacity of these machines depends upon the character of the coal and the condition of the mine. A single cut

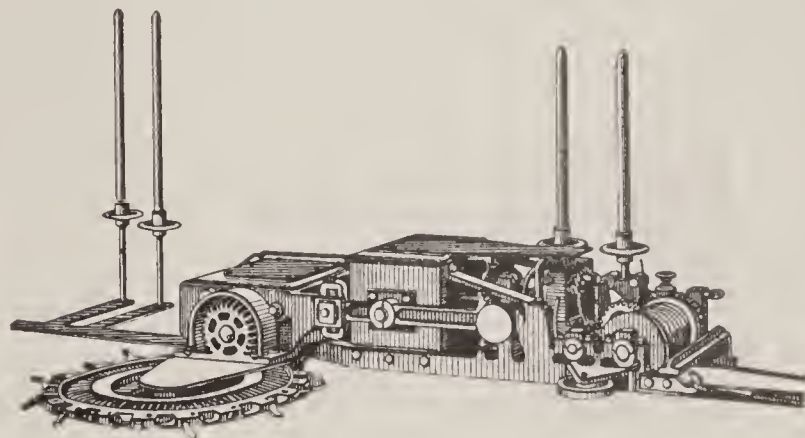


Fig. 7.

other similar arrangement, operated by a ratchet lever connected with the motor and the driving sprocket, winds up a wire or chain cable which is attached to one end of the frame and passes around a sheave fastened to the front jack. The action of this arrangement feeds the machine along the face of the coal. In undercutting, a jackscrew forces the cutter-bar under the coal where it is retained by the action of the bits on the moving chain, against the coal, without requiring a rail or other contrivance to keep the machine in position. The average work accomplished by a machine of this type is 500 lineal feet of undercutting in one shift.

The "cutter-wheel" machines of this class employ a cutter wheel in the periphery of which the bits or cutters are inserted, instead of a chain which travels around the edge of the cutter-bar. They are operated either by electricity or by powerful twin compressed air engines and are designed to undercut three, four, or six feet in depth, with a kerf of about four inches. As in the case of the cutter-bar machines, suitable arrangements are provided to tilt the cutter-wheel so that it will not only avoid very hard substances, but will also follow the variations in the inclination of the bottom.

Good ventilation becomes a prime necessity from the very beginning of coal mining operations. This is secured by various means, ac-

COAL MINING MACHINERY

According to the character of the mines. Sometimes the fire of a furnace placed over the shaft produces a sufficiently strong upward current of air, but it is not applicable to fiery mines, and for such, and in general in all large mines, various forms of revolving fans and exhaust ventilators are used for this purpose.

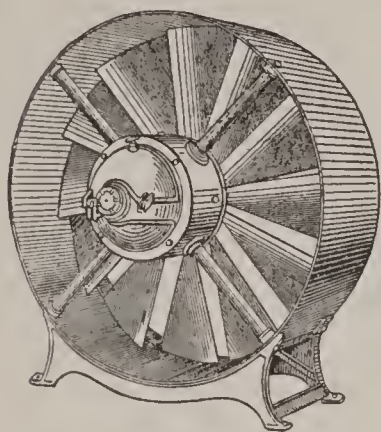


Fig. 8.

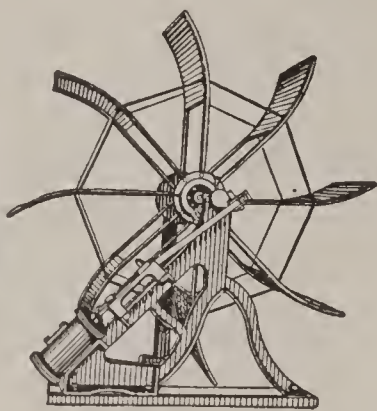


Fig. 9.

Fig. 8 shows a type of these machines that may be driven by belting or by a direct connected electric motor, and Fig. 9 shows a form of steam mine ventilating fan with curved vanes, which is operated by a steam engine especially designed for the purpose, and mounted on the same frame with the fan. Some of these fans range in size up to 35 feet in diameter, and are employed to draw the air out of, or

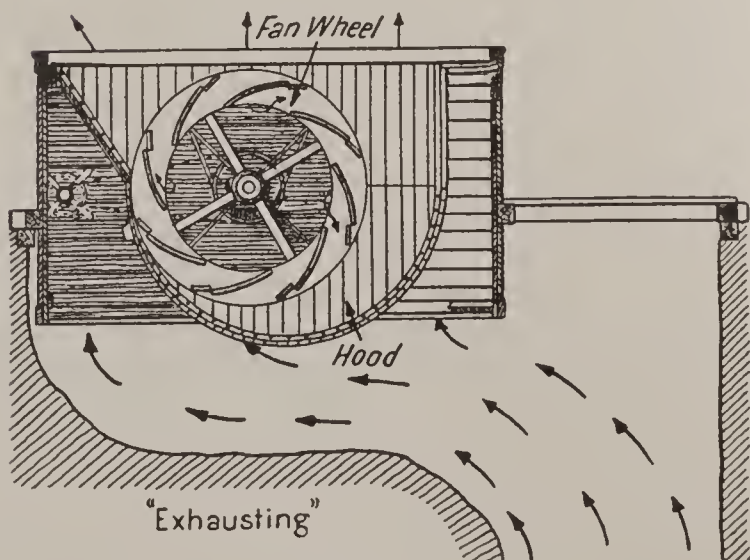
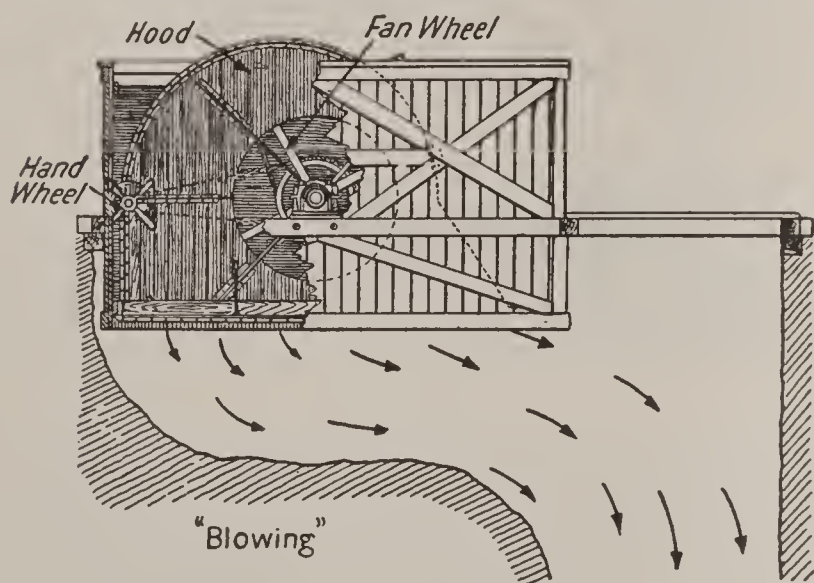


Fig. 10.

force it into, the mines. Fig. 10 shows a Bullock Champion ventilator which may be used as an exhauster or a blower, as circumstances may require. It consists of a fan-wheel, which may be driven by belting or by a direct connected steam engine or other motor, and a

hood and attendant diaphragm that may be revolved independently of the motion of the fan wheel, by a hand wheel, thus changing the current at will from exhausting to blowing or vice versa.

Mine haulage.—Up to a very recent period, the coal cut by the various machines already described has been hauled from the side headings or rooms to the shaft bottoms almost exclusively by mules, but they are being rapidly supplanted by improved systems of steam haulage in the anthracite coal regions, and electric haulage in the bituminous drift mines adopted to meet the demands of various conditions which necessitate haulage systems of greater speed and power than that afforded by the use of mules.

The solution of the problem of mine haulage, constantly increasing in complexity by the longer haulage consequent to the extension of the mines, and the demand for a larger output, requires the consideration of several important factors, such as the grades of the haulage roads, the height of the veins of coal, and the expense of the installation and maintenance of the various forms of haulage machinery. Electricity as applied to mine haulage appears to satisfy these conditions better than any other form of power, and the development and extensive use of the electric mine locomotive is the natural result of the best efforts in this direction.

These locomotives are made in a great variety of forms and are equipped with single or double multipolar motors. They range in weight from 2½ to 15 tons, and are operated either by the more familiar overhead trolley

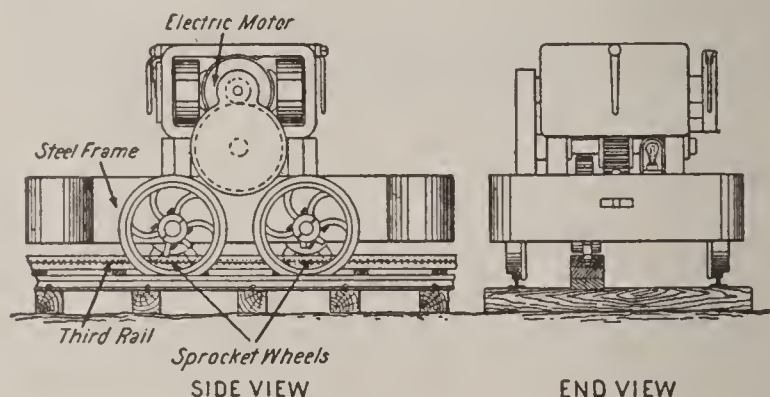


Fig. 11.

wire, or the later third-rail systems. The latter consists of a stationary third rail of heavy iron bars running between the two track rails, which are used as the return conductor. The bars of the third rail are perforated at regular intervals throughout their entire length, and are made into a continuous rail by means of fish plates. The locomotive consists of a substantial steel frame mounted on suitable track wheels. This frame also carries two steel sprocket or traction wheels, which are driven by the electric motors of the machine, by means of suitable gearing. These sprocket wheels engage the third rail through the perforations therein, and serve the double purpose of driving the locomotive along, and taking up the current from the third rail to feed the electric motor. The third rail is enclosed in an insulating wood casing, and is usually laid about five inches off the centre of the regular track, thus allowing sufficient room for the animals to work without interrupting the operation of the mine while the plant is being installed. Fig. 11 gives a general illus-

COAL MINING MACHINERY

tration of the system, the chief advantage of which appears to be its positive working; the practicability of using light rails on heavy grades; and the minimum consumption of power in moving the dead weight of locomotives of comparatively light tonnage. The locomotives used at the present time in operating the "Morgan" electric third rail haulage systems range from 6,000 to 10,000 pounds in weight, and range in capacity from 75 to 150 horse-power. The smaller machines are equipped with single motors and the larger with double motors, wound for either 250 or 500 volts, as may be

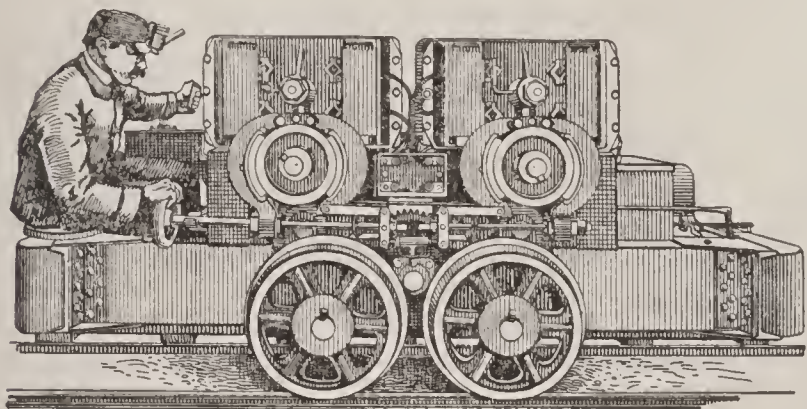


Fig. 12.

desired. Fig. 12 illustrates a 150 horse-power locomotive of this type with the operator in position.

These locomotives as well as those operating the trolley systems are capable of hauling trains of 40 to 50 cars each, or about double the number of cars usually comprising a cable train. These cars are made in a great variety of forms to adapt them for different kinds of service, and have either steel or wooden bodies. They are arranged to open at the side, or with a "drop-gate" having "wings" which prevent

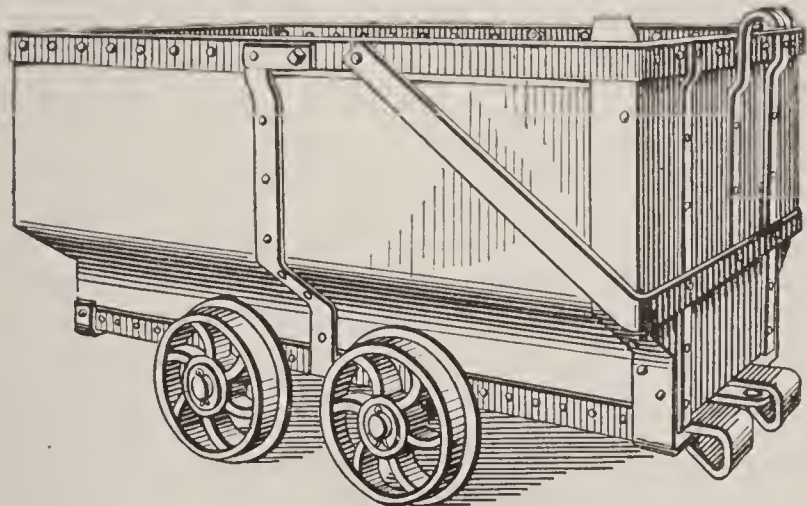


Fig. 13.

the coal from spilling out at the ends of the gate when lowered. This gate also serves as an extension platform from which the coal may be conveniently shoveled. Fig. 13 shows the general construction of steel coal or pit cars, and Fig. 14 shows an electric 10-ton locomotive of the trolley type, hauling a trainload of coal.

The coal when brought out of the mines is prepared for shipment. At many of the bituminous mines it is screened and shipped as lump or slack, or it is first broken and washed before shipment. The washing of coal to free it from impurities such as shale, slate rock, sulphur, and clay, is generally recognized by

coal operators as a treatment that not only increases the value of small coal, but saves a great deal of that which otherwise would go to the culm pile and be totally wasted.

A washing plant, Fig. 15, consists essentially of a structure containing a storage hopper, a cone-shaped washer tub, a pump to supply the water, suitable belt or bucket conveyors to haul the coal, and the necessary engine equipment to furnish the driving power.

The "washer proper," Fig. 16, consists of a steel bell-shaped cone with refuse chambers

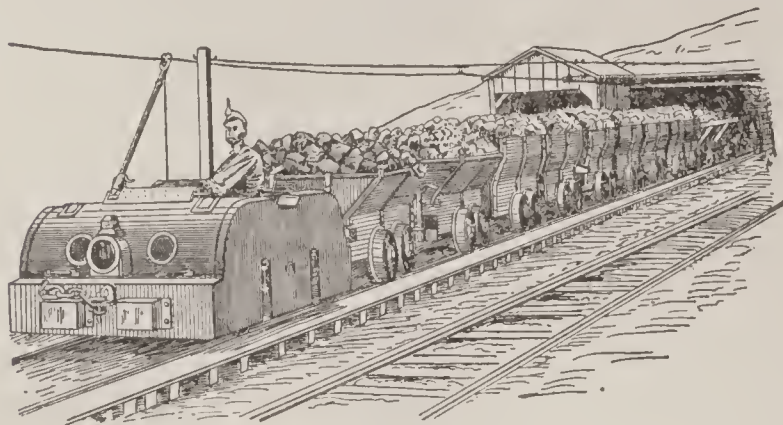


Fig. 14.

operated by rack and pinion, together with the central shaft and its projecting arms and stirring blades. The coal is brought to the washer directly in pit cars or by chain elevators and conveyors, and is discharged into the "washer tubs" through the spout (a), from which it passes into the centre ring (b). The water enters through the housing (c) and passes into the tub through the interior perforations (d). The coal is kept in a constant state of agitation by the "stirrers" and as it descends in the tub it meets the upward current of the water which carries the good coal with it and discharges it

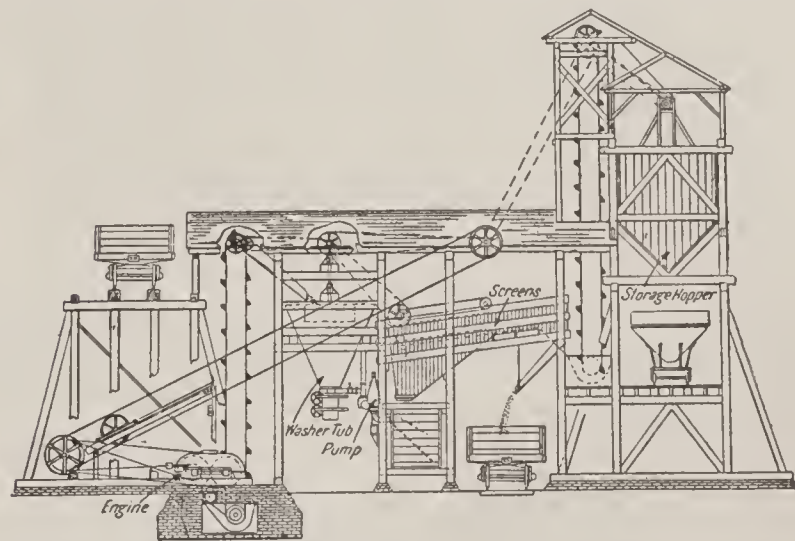


Fig. 15.

at the overflow (f), while the impurities such as sulphur, slate, and bone coal, of greater specific gravity than the good coal, pass downward and settle in the chamber (g). When this chamber is filled, the upper valve (h) is closed and the lower valve (k) is opened and the collected refuse discharged. Then the lower valve is closed and the upper valve opened in preparation for a repetition of the operation. The good coal passes out with the overflow onto inclined perforated chutes or screens, by which it is drained and then delivered by means of conveyors to storage bins, or is allowed to fall directly into cars for transportation. A sup-

COAL OIL — COAL-TAR

plementary settling tank or "sludge," Fig. 17, is useful in treating such grades of coal of which the finer portion is carried away by the overflow and totally lost. It consists of a

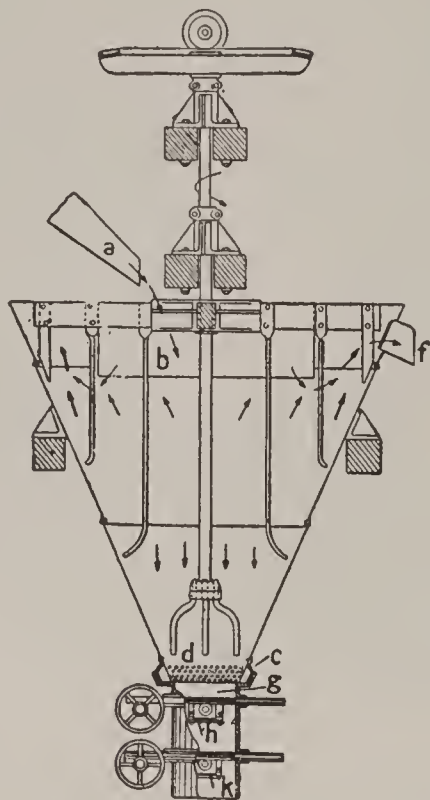


Fig. 16.

wooden or steel tank separated by partitions into three parts (a), (b), and (c), which are connected together by weirs over the partitions. The water carrying the fine coal is delivered into (a), from which it passes into (b),

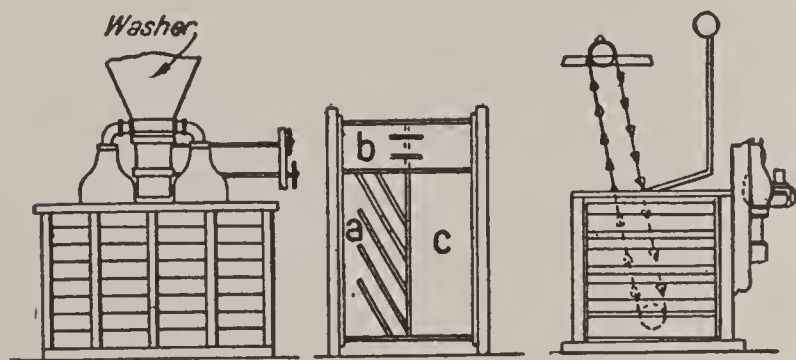


Fig. 17.

and thence into (c), from which it is taken out by pumping. The bottoms of (a) and (c) slope toward (b), which acts as the boot of a

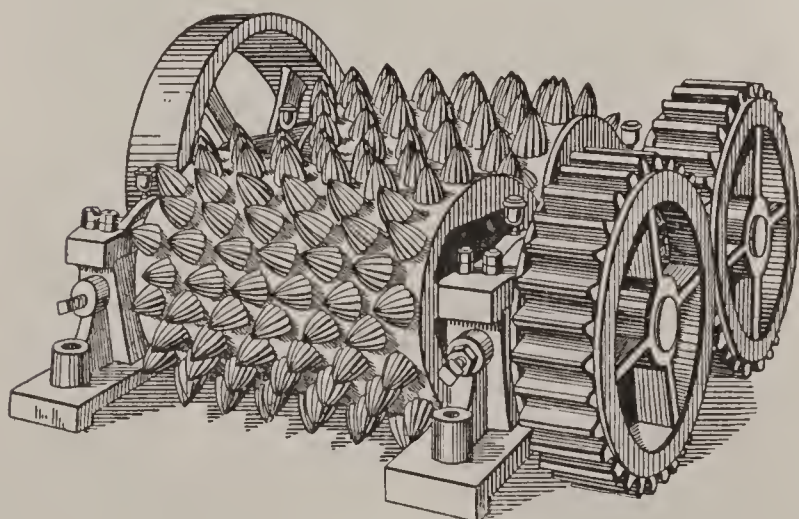


Fig. 18.

perforated bucket elevator. The bottom of (a) is roughened for the greater part of its width, so that it gathers the fine coal as it settles and

delivers it at the centre of (b), from which it is removed by the buckets of the elevator. The capacity of coal-washing plants ranges from 20 to 60 tons per hour. By their use a better quality of fuel coal is obtained, and also an improved charging material in the production of coke.

The preparation of anthracite coal for shipment is quite different from that of the bituminous varieties. It is usually shipped in seven or more sizes, obtained by passing it through a "breaker" equipped with a system of crushing

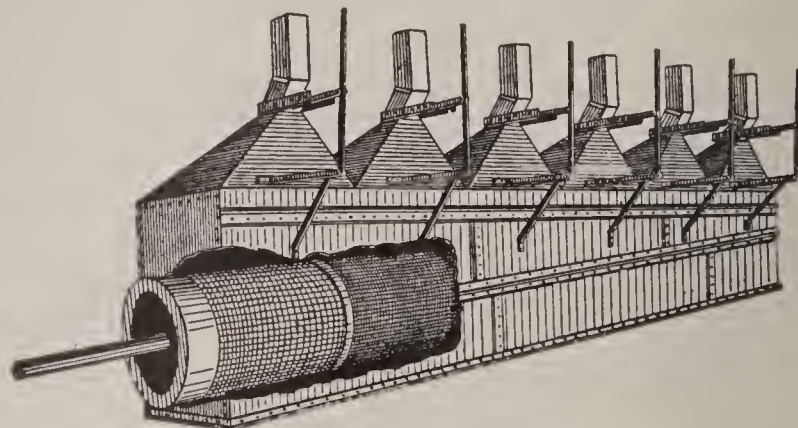


Fig. 19.

rolls and screens, which break up and separate it into the sizes desired. The coal brought from the mines is first dumped onto flat oscillating screens through which the fine coal is sifted. The large chunks are then passed through the crushing rolls, Fig. 18, equipped with sharp teeth which break the coal into smaller pieces of various sizes. From the rolls it passes into revolving screens, Fig. 19, of perforated metal, or wire cloth, through which the pieces of each size are dropped into separate chutes, from which they are discharged into the storage bins. WILLIAM MOREY, JR., C. E., Consulting Engineer, New York City.

Coal Oil. See PETROLEUM.

Coal-tar, or Gas-tar, the black, opaque liquid obtained by condensation from the products of the distillation of coal. As it comes from the condensers it contains more or less water, which rises to the surface when the liquor is allowed to stand for a time, bringing with it the ammonia and ammoniacal salts that are present. The tar as thus freed from water is used in the crude form for a variety of purposes, notably as fuel, for the preservation of building-materials, and the manufacture of sheathing-paper. It is exceedingly complex in chemical constitution, something like 100 different substances having been recognized in it up to the present time, many of which are of great industrial importance. In the utilization of coal-tar for the manufacture of these, it is first roughly separated into parts by fractional distillation,—an operation that is rendered possible by the fact that the various constituents have widely different boiling-points. The distillation is carried out in wrought-iron retorts, and the details of the operation vary somewhat among the different manufacturers. The scheme here given probably represents average practice.

The temperature of the retorts containing the tar being gradually raised, the first products to be expelled are certain gaseous or very volatile substances, such as sulphuretted hydrogen and carbon disulphide, which must be carefully

COAL-TAR COLORS

treated to avoid danger from fire, since their vapors form explosive mixtures with air. As the temperature gradually rises, other bodies are driven off, and the total product that is obtained at temperatures below 350° F. is kept separate, and designated "light oil." This is treated with soda lye, sulphuric acid, and water, and is then redistilled, fractionally, in special apparatus and in a much more careful manner. By accurate regulation of the temperature, benzene, toluene, and the xylenes are successively obtained, followed by other products that are of less commercial importance.

That portion of the original tar which comes off at temperatures between 350° and 445° F. is known as "carbolic oil," or as "heavy oil" (because it sinks in water), and serves as a source of two exceedingly important substances known as naphthalene and carbolic acid. The former separates out from the heavy oil upon cooling. It is then pressed, treated successively with caustic soda and with sulphuric acid, and redistilled. When purified, it is used in the manufacture of dyes. The liquor from which the naphthalene has crystallized out is shaken with caustic soda solution to extract the carbolic acid and cressol. Upon standing, the aqueous solution containing those substances rises to the top and is removed. Sulphuric acid is then added to it, when the carbolic acid and cressol separate in an oily form. Carbolic acid is greatly used as a disinfectant, and as a raw material for the manufacture of numerous other important substances.

That part of the original tar which distils between 445° and 520° F. is known as "creosote oil," and is used for the preservation of timber. This portion consists mainly of carbolic acid, cressol, anthracene, and naphthalene. That part of the tar which passes over at temperatures above 520° F. is known as "anthracene oil," or "green grease," and is used for the manufacture of anthracene (q.v.), and hence alizarin (q.v.) and the alizarin colors. The final product that is left in the retorts after the extraction of the anthracene oil is called "pitch," and is used in the manufacture of artificial asphalt.

It need hardly be said that when a manufacturer is concerned with only a limited number of the coal-tar derivatives, he modifies the process of distillation in accordance with his immediate needs, so as to obtain the greatest yield that is economically possible of the particular substances in which he is interested. Hence the temperature-limits that are given above, for the various portions of the distillate, are subject to certain modifications according to the special end in view. See COAL-TAR COLORS.

Coal-tar Colors, the coloring matters that are artificially prepared from substances occurring in coal tar. They are exceedingly numerous, and are mostly of complex chemical constitution, belonging to the group known as aromatic compounds (q.v.). The coal-tar colors are exceedingly important in the arts, and are used in enormous quantities in dyeing and calico-printing. In popular language they are often called aniline colors. This designation is incorrect, however, for although they include the colors of the aniline class they also include derivatives of phenol, anthracene, and other bodies. Some prejudice exists against the coal-tar colors in the public mind, because they are

believed to be less permanent than the natural animal and vegetable colors, for which they are substituted. This criticism was quite justifiable some years ago, but a considerable number of coal-tar colors are now known which are fully as "fast" as the natural ones, and in some cases the coal-tar color has a decided advantage in this respect. England may be regarded as the original home of the coal-tar color industry, but in recent years it has passed largely to Germany and France, the change being due in large measure to the attention that is paid in the educational institutions of the latter countries to the subject of synthetic chemistry. Following are a few of the more notable events in the history of the development of the coal-tar color industry, as given by Benedikt: Naphthalene was first discovered in tar in 1820 by Garden; anthracene in 1832 by Dumas; and phenol in 1834 by Mitscherlich. Faraday discovered benzene in 1825, but its presence in coal-tar was not recognized until 1845, by A. W. Hofmann. In 1826 Unverdorben discovered aniline among the products obtained in the dry distillation of indigo, and in 1834 Runge proved its existence in coal-tar, and observed that it gives brilliant colors when brought in contact with chlorid of lime. In 1834 Mitscherlich discovered nitrobenzene, and in 1842 Zinin showed that aniline can be manufactured by the reduction of nitrobenzene. The last-mentioned discovery was of exceeding importance, for although aniline occurs in coal-tar it is in such small quantities that it could not be profitably extracted on a commercial scale. In 1854 Bechamp greatly improved the process of manufacturing aniline from nitrobenzene, and in 1856 Perkin prepared mauveine (the first aniline dye) on a large scale. In 1858 A. W. Hofmann published a paper in which he showed that magenta (aniline red) can be prepared by the action of carbon tetra-chlorid upon aniline, and in 1859 Verguin first manufactured magenta in quantity. During the next few years various other colors were discovered and placed on the market, and aniline black was discovered by Lightfoot in 1863. Pelletier and Walter discovered toluene in 1837, and in 1848 Mansfield showed that this substance occurs in coal-tar. The coal-tar color industry was greatly stimulated when Graebe and Liebermann effected the synthesis of alizarin in 1868, thereby opening up a new and important field of chemical activity. Previous to this date alizarin was obtained from madder-root, but it is now almost exclusively manufactured from anthracene. Baeyer produced the first eosin dye in 1874. The synthesis of indigo was the result of a long series of investigations, the final step in which was taken by Baeyer in 1878; and in 1880 a German company placed a substance known as nitrophenyl-propionic acid on the market, for depositing artificial indigo upon fibres by Baeyer's method. Other methods for the artificial manufacture of indigo have since been discovered, but the natural dye is still largely used in spite of all efforts to displace it.

The marks that are used in commerce for designating the shade of a color consist usually of certain letters affixed to the name of the color to be described. Thus R is used for red, O for orange, J or G for yellow (Fr. *jaune*; Ger. *Gelb*), B for blue, and V for violet. Thus "Scarlet RR" or "Scarlet 2R" signifies a scarlet whose tint inclines toward red, and the doubled

COAL-TAR COLORS

R signifies that an intermediate color is recognized, whose tint lies between that here specified and the pure scarlet. Aniline blue occurs in a reddish shade which is designated as "Aniline blue R"; while the finest quality of aniline blue is designated as "Aniline blue 6B."

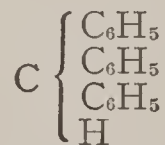
Much attention has been paid to the connection between the color of a substance and its chemical constitution, but no absolute rule can be given for predicting the color of a compound whose formula is known. In the case of the aromatic series, however (which is of special interest to the student of coal-tar colors), the following may be said: All of the aromatic hydrocarbons are colorless (or white), and the same is true of such of their mono-substitution compounds as are obtained by replacing one atom of hydrogen OH, NO₂, or NH₂. If two hydrogen atoms are replaced, the resulting compound is also colorless if the radicals introduced are alike. If they are unlike, and one of them is NO₂, then the resulting compound is colored. For example, benzene, C₆H₆, is colorless, and so also are its derivatives, aniline (C₆H₅.NH₂) and nitrobenzene (C₆H₅.NO₂), which are obtained by replacing one atom of hydrogen by NH₂ and NO₂, respectively. But if a second atom of hydrogen in the benzene nucleus of aniline be replaced by NO₂, we have the compound NO₂.C₆H₄.NH₂, which is known as nitroaniline and is yellow. The presence of certain atomic groups in the molecule of a substance appears to have a strong influence, also, upon the color of the compound. This is particularly noticeable in the quinones, which contain the group .O.O., and in the azo compounds, which contain the group .N:H. . The difference between a colored substance and a coloring matter, or dye, must be borne in mind, however. A dye is a substance which unites directly with the animal or vegetable fibres of the fabric to which it is applied, or with a mordant with which those fibres are impregnated. According to Witt, a true dye must contain two species of molecular groups, one of which is called the chromophor ("color-bearer"), while the other serves to make the compound acid or basic, so that it can form salts. The groups NO₂, .N:N., and .O.O. are examples of chromophors. Compounds that contain chromophors, but are neither acid nor basic, are called chromogenes ("color-generators"). They are not dyes, but may be transformed into dyes by the introduction of a salt-forming group such as OH or NH₂. Azobenzene, C₆H₅.N:N.C₆H₅, is a colored substance, but it is not a dye. It is a chromogene, however, because it contains the chromophor-group .N:N.; and if one of its hydrogen atoms is replaced by the group OH, the compound C₆H₅.N:N.C₆H₄.OH, known as oxyazobenzene, is obtained, which is a true dye. Again if one of the atoms of hydrogen in azobenzene is replaced by NH₂, the compound C₆H₅.N:N.C₆H₄.NH₂ is obtained; this is also a true dye, and is known to chemists as amidoazobenzene. (Consult: Hjelt, 'Principles of General Organic Chemistry,' from which these examples are taken.) Coloring matters that are basic in nature are always used, in dyeing, in the form of salts; that is, it is the compounds of these substances with acids that are used, and not the free bases themselves. "Substantive" coloring matters are those that are directly absorbed from solution by the fibre to be dyed. "Adjective" coloring

matters are those that are not directly absorbed in this manner, but which require the fibre to be first "mordanted," or charged with certain metallic salts, or "animalized" with albumen, or treated in some other manner, before the dyeing can be done.

Classification.—It is impossible to give an entirely satisfactory classification of the coal-tar colors. The following scheme is due to Benedikt, and appears to be as good as any. (See Benedikt, 'The Chemistry of the Coal-Tar Colors,' for a full account of these colors and of their chemical relations.)

- 1.—ANILINE DYES.
 - (a) *Rosaniline Group.*
 - (b) *Indulines and Safranines.*
 - (c) *Oxazines.*
 - (d) *Aniline Black.*
 - (e) *Thionines* (coloring matters containing sulphur).
- 2.—PHENOL DYES.
 - (a) *Nitro Bodies.*
 - (b) *Nitrous Derivatives* (coloring matters formed by the action of nitrous acid on phenols).
 - (c) *Rosolic Acid.*
 - (d) *Phthaleins and Indophenols.*
- 3.—AZO DYES.
 - (a) *Amidoazo Dyes.*
 - (b) *Amidoazo Sulphonic Acids.*
 - (c) *Oxyazo Dyes.*
- 4.—ARTIFICIAL INDIGO.
- 5.—ANTHRACENE DYES.

ANILINE DYES.—*Rosaniline Group.*—The coloring matters belonging in this group may be regarded, for the most part, as derived from two fundamental "mother substances," known respectively as triphenylmethane and tolyldiphenylmethane. Triphenylmethane, C₁₉H₁₆, is (in theory) obtained from methane, CH₄, by replacing three of the hydrogen atoms by three phenyl radicals. It therefore has the constitutional formula



The carbon atom which serves to unite the three phenyl radicals to the single hydrogen atom is known as the methane carbon. Tolyldiphenylmethane is derived from triphenylmethane by replacing an atom of hydrogen, in one of the phenyl radicals, by methyl, CH₃. Numerous basic substances are obtainable from these by replacing one hydrogen atom in two or three of the phenyl groups by NH₂, and by subsequently replacing the hydrogen of the NH₂ by methyl, phenyl, etc. The bases so obtained are colorless, from which circumstance they are known as the "leuco-bases." By oxidation they are converted into the color bases, which are also colorless for the most part. Prominent among the color bases are the two substances known as rosaniline and pararosaniline. Rosaniline (q.v.) is most conveniently obtained by oxidizing a mixture of aniline and liquid orthotoluidine. (See TOLUIDINE.) Pararoslaniline is formed in the same way from aniline and solid paratoluidine. Pararoslaniline may be prepared, however, from triphenylmethane, and rosaniline from tolyldiphenylmethane. The dyes that are classed under the rosaniline group are the salts of the color bases referred to above. Thus magenta (or fuchsin) is a mixture of the hydrochlorids of rosaniline and pararosaniline, and methyl violet is the hydrochlorid of penta-methylated pararosaniline. Auramine is the

COAL-TAR COLORS

hydrochlorid of the more complicated base imidotetramethylamidodiphenylmethane.

Indulines and Safranines.—The indulines and safranines are distinct from each other in all respects, save that they are derived from the same mother substances. The induline bases are formed when aniline acts upon an amidoazo compound, such as amidoazobenzene (or aniline yellow), with liberation of ammonia. The best-known base of this sort is violaniline. When the same mother substances are caused to interact so that oxidation occurs and hydrogen is liberated (instead of ammonia), safranine is formed. Blackley blue is one of the best known induline colors, and magdala red is one of the best known of the safranine series.

Oxazines.—This group contains coloring matters that may be regarded as derived from phenoxazine,

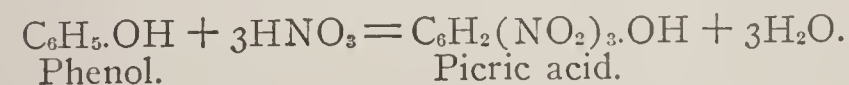


It includes muscarin, gallocyanin (or solid violet), Nile blue, resorcin blue, and prune.

Aniline Black.—This substance is formed by the cautious oxidation of aniline hydrochlorid. If the oxidation is not sufficient, violet or green colors are obtained; while if it is excessive quinone is formed. Aniline black may also be produced by the electrolysis of a concentrated solution of an aniline salt.

Thionines.—Thionine coloring matters are obtained when the hydrochlorids of certain of the aromatic diamines are dissolved in a solution of sulphuretted hydrogen gas, and subsequently oxidized by ferric chlorid. Methylene blue is the only color of this group that is in extensive use. It is prepared from dimethylaniline, $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$, by treatment with hydrochloric acid and sodium nitrite, and subsequent sulphurization with sulphuretted hydrogen, and oxidation with ferric chlorid.

PHENOL DYES.—*Nitro Bodies.*—This group contains substances that are derived from phenol, and are mostly yellow in color. Picric acid, which is one of the best-known examples, is formed by treating carbolic acid (phenol) with nitric acid according to the following equation:



Phenyl brown, Victoria yellow, and naphthol yellow are further examples of dyes of this class. Aurantia, which has the formula $\text{N}(\text{C}_6\text{H}_2(\text{NO}_2)_3)_2.\text{NH}_4$, may be placed in this group. The acid of which it is the ammonia salt is obtained by the action of nitric acid upon methyldiphenylamine, $\text{N}(\text{C}_6\text{H}_5)_2.\text{CH}_3$.

Nitrous Derivatives.—This group consists of those dyes that are obtained by the action of nitrous acid upon such bodies as resorcin, naphthol, thymol, and carbolic acid. Fluorescent resorcin blue is the only example of the group that is in extensive use in the arts. If resorcin is dissolved in sulphuric acid and treated with nitrous acid (obtained by adding nitrite of sodium to strong sulphuric acid), a red substance known as diazoresorufin is obtained, having the formula $\text{C}_{18}\text{H}_{10}\text{N}_2\text{O}_5$. When this body is treated with bromine, a hexabrominated substitution product is obtained, whose ammonium salt is the commercial resorcin blue.

Rosolic Acid.—The rosolic acids may be regarded as rosanilines in which the amido groups

have been replaced by hydroxyl, OH. They may be prepared from the rosanilines or from triphenylmethane. They are classed as phenol coloring matters, however, because they (or at least their more common representatives, the corallins) are more conveniently prepared from phenol. Yellow corallin is obtained by the action of strong sulphuric acid upon phenol, followed by the prolonged action of oxalic acid. It consists chiefly of pararosolic acid (aurin) and of derivatives of rosolic acid. If yellow corallin is heated with ammonia to about 270° F., red corallin, $\text{C}_{19}\text{H}_{13}\text{O}_2\text{NH}_2$, is formed.

Phthaleïns and Indophenols.—The indophenols are formed by the simultaneous oxidation of a phenol and a paradiamine. Commercial indophenol is a blue powder or paste prepared from nitrosodimethylaniline and alpha-naphthol, and is used for obtaining indigo blue shades upon cotton and wool. The phthaleïns are manufactured from phenols and phthalic acid, or phthalic anhydrid; but they may also be regarded (like rosaniline and rosolic acid) as derivatives of triphenylmethane. When a phenol is heated with phthalic anhydrid at moderate temperatures, water is eliminated, and two molecules of the phenol combine with one of the anhydrid, the compound so obtained being known as the phthaleïn of the corresponding phenol. The phthaleïns of resorcin and of pyrogallol are by far the most important ones in the arts. The anhydrid of resorcin phthaleïn (known as "fluoresceïn") is obtained by heating resorcin with the correct molecular proportion of phthaleïn anhydrid to about 390° F., until the mass becomes solid and no more steam is given off. The product so obtained is cooled and pulverized, and sold in this form for the manufacture of the eosins, for which it serves as practically the sole commercial source. Pure fluoresceïn is a yellowish-red crystalline substance, with feebly acid properties. Fluoresceïn is seldom used as a dye, but its sodium salt (uranin) is employed to some extent in printing upon woollens. The empiric formula for pure fluoresceïn is $\text{C}_{20}\text{H}_{12}\text{O}_5$; and its nitro and halogen substitution products are known as eosins. Thus bromine forms, with fluoresceïn, the substitution product $\text{C}_{20}\text{H}_8\text{Br}_4\text{O}_5$, which is known to the chemist as tetrabromfluoresceïn, and to the dyer by various names such as "Eosin yellowish," "Eosin J," and "Soluble eosin." A somewhat similar compound, in which chlorine is the substituted halogen, is known as "Aureosin J."

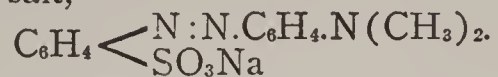
Azo DYES.—These coloring-matters all contain the binary molecular group .N:N., and may be prepared by the action of phenols or aromatic amines upon diazo compounds, which contain the group in question. See *Azobenzene*, under BENZENE.

Amidoazo Dyes.—This group contains only three representatives that are of commercial importance,—aniline yellow, chrysoïdine, and Bismarck brown. They are all derived from azobenzene. Thus aniline yellow is the hydrochlorid of amidoazobenzene, chrysoïdine is the hydrochlorid of diamidoazobenzene, and Bismarck brown is the hydrochlorid of triamidoazobenzene.

Amidoazo Sulphonic Acids.—Helianthin will serve as an illustration of this group of coloring matters. It is prepared by the action of dimethylaniline upon diazobenzene sulphonic

COALING STATIONS — COAST AND GEODETIC SURVEY

acid, and occurs in commerce in the form of the sodium salt,



On silk and wool it yields a fiery orange color. Acid yellow, which consists chiefly of the sodium salt of the disulphonic acid of amidoazobenzene, also belongs in this group, and while it is not used alone to any great extent, it is employed in various combinations, and large quantities of it are also manufactured for use in the preparation of the other diazo coloring matters.

Oxyazo Dyes.— These may be regarded as derived from oxyazobenzene, $\text{C}_6\text{H}_5\text{N:N.C}_6\text{H}_4\text{OH}$, which was first prepared in 1866 by Peter Griess. They are far too numerous and varied to be considered in any general encyclopædia, and they are not treated in any considerable detail even by Benedikt, who says:

The immense number of coloring matters belonging to this group is easily accounted for if we consider that every primary amine belonging to the aromatic series, after having been converted into a diazo compound, will combine with almost any phenol or derivative of a phenol (in which the hydrogen atom standing opposite the hydroxyl group is not substituted) to form an azo dye.

The first patent for a dye of this group was taken out by Griess in 1878, and since that date many others have been taken each year.

ARTIFICIAL INDIGO.— Numerous methods for the artificial preparation of indigo are known, but all are too expensive in execution to displace the natural product to any great extent. For calico printing, extensive use is made of an artificial product known as "propiolic acid," which can be converted into indigo, upon the fibre, by the use of suitable reducing agents. The blue that it gives is not entirely pure, but the printing process is far simpler than when the natural indigo is used, and for this practical reason propiolic acid is preferred. In its manufacture cinnamic acid is first prepared by heating benzal chlorid, $\text{C}_6\text{H}_5\text{CHCl}_2$, with sodium acetate. The cinnamic acid so obtained is treated with fuming nitric acid, and the ortho-nitro-cinnamic acid that is formed is isolated. This is brominated with free bromine, and afterward boiled with potash and alcohol. Ortho-nitrophenyl-propionate of potassium is formed, from which ortho-nitrophenyl-propionic acid (which is the substance commercially known as propiolic acid), $\text{C}_9\text{H}_5(\text{NO}_2)\text{O}_2$, is liberated upon the addition of hydrochloric acid. This is transformed into indigo blue, $\text{C}_{16}\text{H}_{10}\text{N}_2\text{O}_2$, upon boiling with reducing agents, according to the equation, $2\text{C}_9\text{H}_5(\text{NO}_2)\text{O}_2 + 2\text{H}_2 = \text{C}_{16}\text{H}_{10}\text{N}_2\text{O}_2 + 2\text{CO}_2 + 2\text{H}_2\text{O}$.

ANTHRACENE DYES.— The coloring matters derived from anthracene (q.v.) contain hydroxyl (OH), and are slightly acid in nature, forming colored "lakes" with metallic oxides and with the alkaline earths. They require mordants, but they are faster than most of the other coal-tar colors, and are also faster than most of the natural dyes. Alizarin, purpurin, anthrapurpurin, and flavopurpurin are among the better-known coloring matters obtained from anthracene. (See ALIZARIN and PURPURIN.) Alizarin is used in dyeing for red, black, blue, orange, and violet, and has replaced the madder-root dyes almost absolutely.

Many of the more important substances connected with the manufacture and use of the

coal-tar colors will be found under separate headings. The principles that underlie the application of the coal-tar colors in the dyer's art are outlined in the article on DYEING (q.v.). In addition to Benedikt's excellent work, consult: Hurst, 'Dictionary of the Coal-Tar Colors'; Nietzki, 'Chemistry of the Organic Dye-Stuffs'; and Schultz and Julius, 'Systematic Survey of the Organic Coloring Matters.'

A. D. RISTEEN, Ph.D.

Coaling Stations, depots established by maritime governments at various important points throughout the world, where the ships of the navy may obtain supplies of coal. The utility of such stations, when properly fortified, as points of refuge, defense, and repair for warships in the event of war can hardly be over-estimated. The more important of British stations are Aden, at Trincomalee (Ceylon), Singapore, Hong Kong, Sierra Leone, St. Helena, Mauritius, Jamaica, and Simon's Town (Cape Colony). During 1898-1900 the United States established coaling stations for its navy at San Juan, Porto Rico; Pearl Harbor, Hawaii, Pago Pago, Samoa; Cavite, near Manila; at the chief port of Guam, Ladron Islands; and at convenient points in Cuba; and coal "piles" at La Paz, Mexico, and at several points in Alaska. Some of the British coaling stations supply both naval and mercantile vessels.

Coamings, in naval architecture, a framework surrounding the opening of a hatchway, designed to stiffen the parts weakened by the opening, and, by being raised above the deck, to keep water from entering the hold. A rabbet or groove in its inside upper edge receives the hatches.

Coan, kō'ān, **Titus,** American missionary: b. Killingworth, Conn., 1 Feb. 1801; d. Hilo, Hawaii, 1 Dec. 1882. After spending several months (1833-4) on a dangerous exploring expedition in Patagonia, he went to the Sandwich Islands (1835), occupying the Hilo station 47 years, and in that time converting 14,000 natives. He wrote: 'Adventures in Patagonia' (1880); 'Life in Hawaii' (1881).

Coan, Titus Munson, American physician and critic, son of Titus Coan (q.v.): b. Hilo, Hawaii, 27 Sept. 1836. He now resides in New York, where he founded in 1880 the New York Bureau of Literary Revision. He has written: 'An Ounce of Prevention'; 'Topics of the Time' (edited).

Coanza. See KWANZA.

Coast and Geodetic Survey, United States. To all nations whose territory touches the sea or other water navigable to any extent, or who have any interests in the commerce of the sea, a full and complete knowledge of the coast—its nature and form, the character of the sea bottom near it, the location of reefs, shoals, and other dangers to navigation, the direction and strength of currents, and the character and amount of magnetic disturbance—is of the greatest moment.

To supply this knowledge the governments of all maritime nations have in modern times executed surveys of their coasts by the most exact methods.

Some idea of the importance to this country of like operations and their extent may be

COAST AND GEODETIC SURVEY

formed when it is remembered that the coast line of the United States and Alaska, measured along its general trend, exceeds 10,000 miles in length. To represent the actual shore line as surveyed, which includes all the islands, bays, sounds, and rivers in the littoral or tidal belt, these figures would have to be multiplied many times. To this must be added the shore line of Porto Rico, the Hawaiian Islands, and the Philippine Islands. The length of the general shore line of only 14 of the principal islands of the latter group exceeds 11,000 miles.

On the recommendation of President Thomas Jefferson, Congress in 1807 authorized the establishment, as a bureau under the secretary of the treasury, of a national coast survey. For the purpose of furnishing geographic positions and other data to State surveys, the scope of the bureau was in 1878 enlarged, and its designation became the United States Coast and Geodetic Survey.

The plan upon which it is organized is the outgrowth of trial and experience during the first 50 years of its existence, and from its inception almost every year has seen some new feature added or some old one discarded.

Under the direction of a superintendent there are two great divisions of its work. They are the field and the office.

The field work includes all of the practical operations of the survey on land and sea.

Except in time of war, in accordance with the plan of reorganization of 1843, the work upon the land was divided between civilian assistants and officers of the army, the hydrographic parties being in charge of naval officers. Since 1861 no officers of the army have been connected with the survey, and the conduct of the hydrographic work was about equally divided between the civilian assistants and naval officers until 1898, when the naval officers were relieved, and since which time none have been assigned to the survey.

The civilian assistants consist of a body of trained experts permanently attached to the survey, and numbering between 50 and 60.

The service owns a fleet of 11 steamers and 6 schooners, besides steam and motor launches.

The office is that part of the establishment which receives the records, original sheets, etc., representing the results of field work. They are registered and deposited in the archives until in turn they are taken up for examination, computation, and adjustment, prepared for publication, and finally published. Original charts are reduced or enlarged, engraved, electrotyped, and printed.

For the convenience of administration the operations of the main office at Washington are carried on by eight divisions, each having some specified portion of the general work to perform. In these divisions are employed the required force of clerks, draftsmen, computers, engravers, instrument makers, printers, etc., numbering in all about 145.

There are sub-offices at San Francisco, Seattle, Honolulu, and Manila.

Many of the field operations of the survey being geodetic in their nature, a system of primary triangulation, together with the determination of geographic positions by means of astronomic methods, must furnish the foundation upon which the whole rests. On the Atlantic coast a chain of triangles, beginning at the eastern

boundary of Maine, stretches to the Gulf, constituting an oblique arc, which, besides serving as a basis for the coast triangulation, adds much to our knowledge of the figure of the earth.

An extensive system of triangles extends across the continent along the 39th parallel of latitude, connecting the surveys of the two coasts and furnishing a basis for the surveys of the 13 States through which it passes. It is also one of the longest arcs now available for the determination of the figure of the earth. Another triangulation system is being executed along the 98th meridian. Its extension southward through Mexico has already begun, and there is a prospect of its extension northward through the British possessions.

In connection with these principal systems, the triangulation has been considerably expanded in the New England States, New York, and several western States, including California, where some exceptionally large figures were introduced. The longest line so far observed is that from Mount Helena to Mount Shasta, over 190 miles in length.

A tertiary triangulation for topographic and hydrographic purposes has been completed along the entire Atlantic and Gulf coasts, and over more than half of the Pacific coast, except Alaska. Much progress has been made in the latter territory by methods which possess a sufficient degree of accuracy for immediate use and are capable of rapid execution.

In the determination of astronomic positions the exact methods originally developed in the survey have been adhered to and perfected. The methods of using the zenith telescope for latitude and the telegraph for longitude have been constantly improved.

The topographical operations have been mostly restricted to a narrow margin, not often over three to five miles wide, along the coast and surrounding harbors, bays, and rivers up to the head of tide water. In some cases it has been somewhat more extensive, notably in the survey of the District of Columbia, where the scale was 1-4800 and the contour interval only five feet.

The hydrographic operations have extended as far out from the coast as was necessary for the interests of navigation, and have included, all harbors, channels, bays, etc., as far as the work has gone.

Deep-sea soundings have been made extensively, especially in and about the Gulf Stream.

Much attention has been given to tides, and continuous series of tidal records have been obtained at several important points.

The results of the operations of the survey in connection with the study of terrestrial magnetism can be found on its charts and in its other numerous publications on the subject. In addition to the determination of the magnetic elements at many widely distributed points and their frequent redetermination for secular variation, special observations are also made at certain base stations, with the aid of self-registering instruments, for the purpose of obtaining the record of the numerous variations of the earth's magnetism continually taking place.

The study of the force of gravity as a part of the great geodetic problem has received attention for 30 years, and the survey has of late years developed methods and instruments which will lead to a great extension of the work at a less cost

COAST AND GEODETIC SURVEY

than by older processes, but without lowering the standard of accuracy.

A network of precise levels covering in a general way the eastern half of the United States, connecting the Atlantic Ocean, the Gulf of Mexico, and the Great Lakes, has been executed, and in the future will be extended to the Pacific Ocean.

Throughout its history the survey has constantly been called upon to determine boundary lines, both State and national, which have been in dispute.

At the present time, with its assistance, three State boundaries are in the process of settlement.

The Office of Standard Weights and Measures, charged with the maintenance of the standards of length, weight, and capacity, which was under the direction of the superintendent of the Coast and Geodetic Survey until 30 June 1901, is now an independent organization under the title of the "National Bureau of Standards."

The principal publications of the survey consist of about 500 different charts; tide tables for all the principal and many minor ports; a monthly edition of 4,700 copies of a circular known as 'Notice to Mariners,' containing notes of all changes along the coast; 'Coast Pilots,' containing minute sailing directions for all navigable waters along our coast; and the 'Report of the Coast and Geodetic Survey', which contains, besides the reports of the superintendent and his assistants on the conduct of the work, a series of special reports upon various technical and scientific operations of the service. For details of the work of the bureau see CHART; COAST PILOTS; GEODESY; GRAVITY; HYDROGRAPHY; LEVELING; SURVEYING; TIDES; etc.

O. H. TITTMAN,
Superintendent.

Coast and Geodetic Survey, Methods and Publications of. The work of this Survey as briefly outlined by the preceding article may be described in greater detail under the following general headings: (1) Triangulation and Reconnaissance; (2) Base Apparatus; (3) Time, Latitude, Longitude, and Azimuth; (4) Terrestrial Magnetism; (5) Hydrography; (6) Topography; (7) Tides and Tidal Currents; (8) Leveling; (9) Coast Pilots; (10) Charts; (11) Gravity; and (12) Geodesy.

Triangulation and Reconnaissance.—According to the usual practice, the triangulations are classified as primary, secondary, or tertiary, depending upon their relative importance and the size of their individual triangles. The work of selecting the various triangulation points is called *Reconnaissance*. This work increases in complexity according to its character and extent, and ranges from preliminary and minor triangulations of a moderate degree of accuracy along the seacoast, the windings of river mouths, estuaries, etc., for the purpose of selecting points for the control of a hydrographical or topographical survey of limited extent, to the work of selecting and establishing the points of great triangulations required for connecting surveys independently executed many miles apart. The reconnaissance also determines the character and size of the various instruments to be used in the prosecution of the subsequent operations, the kinds of stands or piers to be built to support

those instruments, and the kinds of signals or objects to be used at the distant stations. For great distances, heliotropes are used by day and powerful lights by night. During the past five or six years, acetylene lamps in connection with powerful condensing lenses have been used for night signals.

The theodolites used in primary triangulation are equipped with accurately graduated circles 12 to 24 inches in diameter, reading to seconds of arc or closer, by three micrometer microscopes, the mean of the readings constituting one observation of a direction. Under perfect conditions, a single careful observation would be sufficient; but, in order to eliminate inaccuracies resulting from instrumental defects, personal errors of observers, and the varying meteorological conditions, which influence the line of sight, three successive observations are made on different parts of the circle by shifting it through a definite portion of the circumference after each set of observations. The present practice is to use sixteen positions on the circle, making one reading with the telescope direct and one with the telescope reversed for each position, thus giving sixteen measures of each direction.

The lengths of primary triangulation lines vary according to the character of the country. Very long lines are possible only in high mountain regions. The longest line thus far observed is that from Mt. Helena to Mt. Shasta, California, a distance of 190 miles. In lower countries, heavily wooded regions, or where mountains of nearly the same height are closely crowded together, the lengths of the lines vary from 10 to 40 miles.

In secondary and tertiary triangulation the lengths of the lines range downwards from 20 miles to less than one mile. In this work heliotropes are rarely used, and the angles are often measured with theodolites having circles from 6 to 12 inches in diameter. In general the same principles apply as in primary triangulation, the details of the work varying with the attending circumstances. The lengths of the sides of the triangles are computed from the data obtained by measuring the angles, and the latitudes and longitudes of all stations are computed by geodetic formulæ.

The accuracy of the triangulations is tested in various ways—by determining the error of closure, or by comparing the computed length of a line obtained through a long chain of triangles with an actual measurement of the same line. In the case of the former, the sum of the angles of a plane triangle must equal 180° , and as the same condition applies to a geodetic triangle after it has been reduced to a plane triangle by deducting the spherical excess due to the figure of the earth, any existing difference between 180° and the corrected sum represents the error of closure. In the best work the amount of this difference averages somewhat less than one second. An example of a test by the second method is afforded in the triangulation between the Maryland and Georgia base lines, 602 miles apart. The line tested was a triangle side situated half way between the base lines, and the comparison was made by computing its length from each base line through the triangulation. The discrepancy was scarcely perceptible, being a little more than half an inch in a length of thirty miles. The accuracy

COAST AND GEODETIC SURVEY

of these methods are such that they may be considered practically exact.

Base Apparatus.—Four principal forms of apparatus are used by the Survey for the measurement of base lines. (1) The iced bar, a monometallic single-bar system; (2) the duplex apparatus, a bimetallic multiple-bar system; (3) the secondary apparatus, a monometallic multiple-bar system; and (4) the tape apparatus, a monometallic single unit system.

In the iced bar apparatus, the measuring unit is a steel bar 5 meters long, that length being defined by microscopic lines engraved upon the polished surfaces of small platinum plugs set into the bar near the ends and in its neutral axis. To permit this, the upper part of each end is cut away for a short distance. While in use, the bar is supported in a metallic trough filled with melting ice which keeps it at a constant temperature. The trough is supported upon a carriage movable upon a track built for that purpose. In making the measurements, the successive positions of the ends of the bar are fixed by powerful microscopes firmly attached to stout posts solidly planted in the ground. Measurements possessing an extraordinary degree of accuracy are obtained by the method, but they are considered too slow and costly for determining the length of an entire base line, and the most recent practice of the Survey is to use it for measuring with great precision a distance of 100 meters near and parallel to the base line intended to be measured, and use that length of 100 meters as a field standard for the testing and comparison, under actual field conditions, of the apparatus by which the actual base is measured. When a number of bases are to be measured during the same season, this field standardization is effected at the first and last base lines of the series.

The duplex apparatus has two separate measuring rods in each compound bar, one made of steel and the other of brass. These rods are tubular, the thickness of their walls being based upon the specific heat and conductivity of each metal, and they are given equal capacities for absorbing and radiating heat by being plated with nickel. The rods are so arranged that an independent measure is conducted with each, thus giving for any measured distance two results; one in terms of the steel, the other in terms of the brass component. By means of attached scales direct comparisons between the two are made whenever desired. The difference between the two measures determines the average temperature of the two rods, and also, by means of the ratio of the expansions of the brass and of the steel, the corrections by which the measures are reduced to standard without reference to mercurial thermometers. Each compound bar is, however, provided with three such thermometers, so that a single measurement gives three results, one duplex and two separate thermometric results, which although they are not absolutely independent, yet afford valuable checks upon the reliability of the measurement.

The secondary apparatus is a simple monometallic system which possesses a considerable degree of accuracy. The measuring rods are made of steel. For the purpose of checking radiation they are inclosed in massive wooden bars from which they project a little at each end. Temperatures are determined by means of

mercurial thermometers, two for each bar, which are inclosed in the wooden casing with their bulbs in contact with the steel rod, one near each end. The best results are obtained by equally dividing the measurements between periods of rising and falling temperature.

Steel tapes standardized under field conditions, by comparison with test bases carefully measured with ice bars, have been recently used with marked success. They have also been successfully used in connection with the duplex and the secondary apparatus. The steel tapes now used are either 50 meters (164 feet), or 100 meters (328 feet) long. They are 6.34 millimeters (0.25 inch) wide and about 0.47 millimeters (0.019 inch) thick. While in use they are supported at intervals of 25 meters (82 feet), the intermediate supports being wire nails driven horizontally into the sides of stakes previously arranged for that purpose. In making the measurements, the successive positions of the forward end of the tape are marked upon copper strips fastened to the tops of suitable posts previously aligned and driven into the ground at the proper distances. A tension of 15 kilograms (33.1 pounds) is applied to the tape by means of a lever, the amount of the tension being measured by a spring balance. With this amount of tension the sag of the tape between the supports is very slight, therefore a high degree of accuracy in the measurement of the tension is unnecessary.

The temperature of the tape is determined by two mercurial thermometers attached to the tape near its ends. At the present time all tape measurements are made at night, as it has been found that mercurial thermometers will not accurately indicate the temperature of a tape in daylight. It seems very probable, however, that the use of the "thermophone" to determine the temperature of the tape may enable the making of precise tape measurements in daylight in the near future, and thus considerably facilitate such operations. Its use in this connection was suggested by Professor Burton of the Massachusetts Institute of Technology. The temperature of the tape is obtained by the application of the principle of differential variations, with varying temperatures of the electrical resistances of steel and German silver, the tape for this purpose being made one arm of a Wheatstone bridge. It is also probable that the alloy of steel and nickel called "invar," which is almost absolutely unaffected by changes of temperature, may be successfully used in tape measurements made in the future, and lead to a more frequent use of the tape apparatus with a corresponding increase in the number of geodetic bases.

In comparing the results obtained by the use of the tape apparatus with those of the duplex apparatus, experience shows that the judicious use of tapes readily allows the repeating of a measurement with no greater discrepancy than about one-twelfth of an inch per mile, or about 1 part in 760,000, and that the duplex apparatus admits of a remeasurement with a discrepancy no greater than one-sixteenth of an inch per mile, or about 1 part in 1,000,000. In both cases the accuracy of the measurements is well within the limits required for even the most accurate triangulations, therefore the cost of the work becomes the most important point to be considered in this connection. The cost of measur-

COAST AND GEODETIC SURVEY

ing a base with the duplex or any good bar apparatus is nearly three times as great as that required for tape measurement.

Time, Latitude, Longitude, and Azimuth.—The time determinations as made by the Survey are those required in connection with observations of latitude, longitude, and azimuth.

Time is determined by observations of the sun or stars with instruments which measure their altitude or indicate their meridian passage. Sextants and altazimuth instruments are generally used for approximate determinations, and transit instruments adjusted to the meridian for refined work. With the transits, chronographs are frequently used for recording the observations.

Latitude.—Determinations of an inferior grade are made with sextants or altazimuth instruments by observations on the sun or stars, but determinations of the first order are made by observations on the stars with zenith telescopes. In the latter method, the observation of from fifteen to twenty pairs of stars on three nights is considered necessary for a good determination.

Longitude.—The most accurate results in the determination of longitude are obtained by the telegraphic method, by which the differences of time between the positions in the field and some first class astronomical observatory are determined by the exchange of time signals. The instrumental equipment for this purpose consists of a transit, a break circuit chronometer, a chronograph, and a set of telegraphic instruments at each station. For work of primary importance, the local time is determined in the usual manner at the two places on the same nights for six nights, and a comparison of the chronometers made on each night over the telegraph line by means of chronometer signals. The transmission time of the electric current is derived by sending signals in both directions. The personal equation of the observers is eliminated by the interchange of observers after half the work is completed. In longitude work of the first order, observations on twenty stars each night are considered necessary for an accurate determination of the local time at the two stations, the transits being equipped with Repsold self-registering micrometer eye-piece for the purpose of eliminating the personal equation of the observers.

In cases where the telegraphic method cannot be employed, longitudes are determined by observations of the eclipses of the satellites of Jupiter, of solar eclipses, of moon culminations, of occultation of stars, and by transporting chronometers. The results obtained by these methods are of varying degrees of accuracy depending upon the inherent errors of the methods themselves.

Azimuth.—Astronomic observations of azimuth are made to ascertain the directions of the lines established by a survey relative to the true meridian. Azimuths differ in grade according to the purposes for which they are required. For exploration work and reconnaissance, or for magnetic observations, theodolites with 3 to 6 inch horizontal circles are used to observe on the sun or on Polaris. For tracing meridian lines, or for tertiary triangulations, theodolites with 6 to 10 inch horizontal circles are used to observe on circumpolar stars. For primary tri-

angulations, requiring the determination of high grade azimuths, only circumpolar stars are observed with theodolites having 12 to 16 inch horizontal circles reading to single seconds by micrometer microscopes. In this class of work accurate time is always provided for except when the observations are made at elongation. A terrestrial mark is always used in connection with all azimuth observations.

Terrestrial Magnetism.—The complete magnetic work embraces the determinations of the three magnetic elements: the "declination" or "variation" of the compass, the "dip" of the magnetic needle, and the "intensity" of the magnetic force.

As it is impossible to represent the earth's magnetic condition for more than a definite moment of time, it is of great importance to provide for a continuous record of the innumerable fluctuations of the magnetic needle. In the work of the Survey, this is accomplished by the establishment of certain base stations equipped with sensitive magnetic instruments which make a continuous record, day and night, of the variations of the magnetic forces. At the present time these stations are situated at Cheltenham, Maryland; Baldwin, Kansas; Sitka, Alaska; Vieques, Porto Rico; and near Honolulu, Hawaii. From their records the magnetic charts are brought up to date and surveyors and mariners are provided with the exact amount of variation or change at any point between any two given dates. In addition to this work, true meridian lines are being established near the various county seats throughout the country for the purpose of enabling the surveyors to test and verify their compasses.

Hydrography.—The various processes which comprise the hydrographic work, and by means of which the shape of the submerged portions of the earth's surface is determined and subsequently delineated on the maps in the form of channele banks, and shoals, may be summarized as follows: (1) by triangulation certain points are established on the land from which the positions of the soundings subsequently taken are determined; and (2) by a topographical survey the positions of the shore lines, wharf lines, rocks that show above water, and the limits of dry shoals and banks are obtained. The data thus obtained is plotted on a map based on a suitable projection, the scale of which depends upon the minuteness of detail with which the submerged features are to be delineated. A scale of $\frac{1}{10,000}$ is considered as well adapted for the survey of most harbors.

Such a map shows the geographic positions of the various points such as church spires, chimneys, peculiarly shaped rocks and trees, and signals built over triangulation stations, selected as suitable to observe upon in locating the positions of the surroundings.

When a sufficient number of such signals and objects is available, and the tide gauge or staff has been erected at some point in the vicinity of the work, the lines of soundings are run by a boat and the soundings taken with a leadline.

A sounding party usually consists of the officer in charge, two observers with sextants, a recorder with watch or clock and record book, the leadsman with his leadline, and four oarsmen.

The method of operation is as follows: Beginning at a point, the position of which relative

COAST AND GEODETIC SURVEY

to the shore is noted by the recorder, the observers measure the angles between three signal points on shore and read the angles measured; the leadsman gets a cast of the lead and calls out the number of feet or fathoms; and the recorder records all of these together with the time when the boat commenced to move along the line of soundings. Once started the boat continues without stopping to the end of the line. In the meantime other pairs of angles are taken by the observers at three or four minute intervals, or as often as necessary, each set of angles locating the position of the boat at the instant of observation. A final set of angles is taken at the end of the line, and the boat is then moved to position at the beginning of a new line of soundings. When the depths change rapidly the soundings are taken as frequently as possible, the time being noted to seconds; but, when the depths are nearly uniform, indicating a comparatively level bottom, the soundings are preferably taken at equal intervals of time. When practicable the lines of soundings are run on ranges, i. e., the boat being kept on the same line with two objects on shore. The correction for the difference of level due to the rise and fall of the tide during the sounding operations is obtained from the readings of the tide gauge, such readings usually being made at five or ten minute intervals by an observer specially detailed for that purpose, and all the soundings reduced to the common plane of mean low water, the plane of reference adopted by the Survey for its charts of the Atlantic and Gulf Coasts. In smooth, shoal water, it is required that the reduced soundings on lines crossing each other shall not differ more than $1\frac{1}{2}$ per cent. of the depth. In deep-sea work, offshore, the tidal correction is not applied to the soundings.

At the end of each day's work the results are graphically transferred to the map, every position of the boat corresponding to any pair of angles measured on any three points on shore being plotted by means of a three-armed protractor. The successive positions of the boat being thus located on the map, the various soundings are easily and accurately spaced between them from the number and time intervals shown in the record.

The methods described above are employed to develop the slopes of the bottom, but in regions like the coasts of Maine and Alaska, which are characterized by many isolated rocks and ledges on the bottom, or like the coasts of Florida, Porto Rico, and the Philippines, fringed with coral reefs and numerous coral heads, supplemental special examinations are made where soundings on the regular lines shoaler than the surrounding depths indicate the existence of yet shoaler water. Such examinations are greatly facilitated by the use of the "channel sweep." This device is attached under the vessel and gives it any desired draft of water up to 6 fathoms. By its use many rocks are discovered which the leadline fails to develop. It is also used to verify channels that have been marked out through reefs, or areas of broken ground.

In the work of deep-sea sounding, the leadsman is replaced by a sounding machine, the leadline by a fine steel piano wire, coiled on a drum, and the lead by a solid spherical shot weighing about 100 pounds. While sounding, the ship remains in sight of land, her position

being determined in a manner similar to that explained above in the case of the boat. The depth is obtained by recording the number of revolutions of the drum, the shot being automatically detached from the wire when it reaches the bottom.

Topography.—The principal method employed by the Survey in the execution of its topographic work is that which requires the use of the plane table and stadia. All the necessary operations for producing the topographic features of the map are executed by those instruments in the field with the country as a model. In special cases other instruments are employed as auxiliaries, but in general the plane table alone fulfills all the requirements. On account of the rapidity and comparative accuracy with which the results are obtained by the graphic solution of the three point problem by the plane table, thus enabling the topographer to ascertain his position at an unknown point, together with the effective use of the stadia, this method is peculiarly fitted for delineating coast topography, usually characterized by such features as outlying islands and ledges, inaccessible rocky bluffs, and large marshy areas intersected by numerous streams.

Tides and Tidal Currents.—The vertical motion of the water surface is called the "tide," and the horizontal motion of the water itself is called the "tidal current" or the "tidal stream." The latter is oftentimes of much greater importance to navigation than the former, and on account of the many difficulties which have to be surmounted in obtaining sufficient information to enable predictions relative to their direction and velocity at any particular time and place, they require very careful consideration. Tidal observations are made either upon a simple graduated staff, or else by means of a self-registering gauge. The latter is always employed in places where a long series of observations is desired. It consists of a simple but ingenious combination of a clock mechanism with a recording apparatus in which a pencil, controlled in a lateral position by the rise and fall of the water, traces an undulatory curve upon a long strip of paper which moves slowly at right angles to the motion of the pencil and is regulated in its progress by the clock which controls the apparatus.

Leveling.—The work of leveling is executed by two principal methods: (1) by the use of precise spirit levels; and (2) by vertical angulation.

The precise level used by the Survey differs from other instruments of this class in the following particulars: The telescope and level are irreversible; the Y's are absent; the level is rigidly fastened to the telescope, and is placed closer to its center line by being countersunk into the barrel of the latter; the use of an alloy of nickel and iron, having a small coefficient of expansion, in the construction of the telescope and the adjacent parts; the protection of the level vial and the middle of the telescope from sudden and unequal variations of temperature by incasing them in an outer tube, and the provision of an arrangement by the use of which the observer is enabled to see, without changing his position, the level bubble with his left eye at nearly the same instant the rod is read through the telescope with his right eye.

In the execution of the field work, a line of precise levels is always run twice, usually in

COAST AND GEODETIC SURVEY

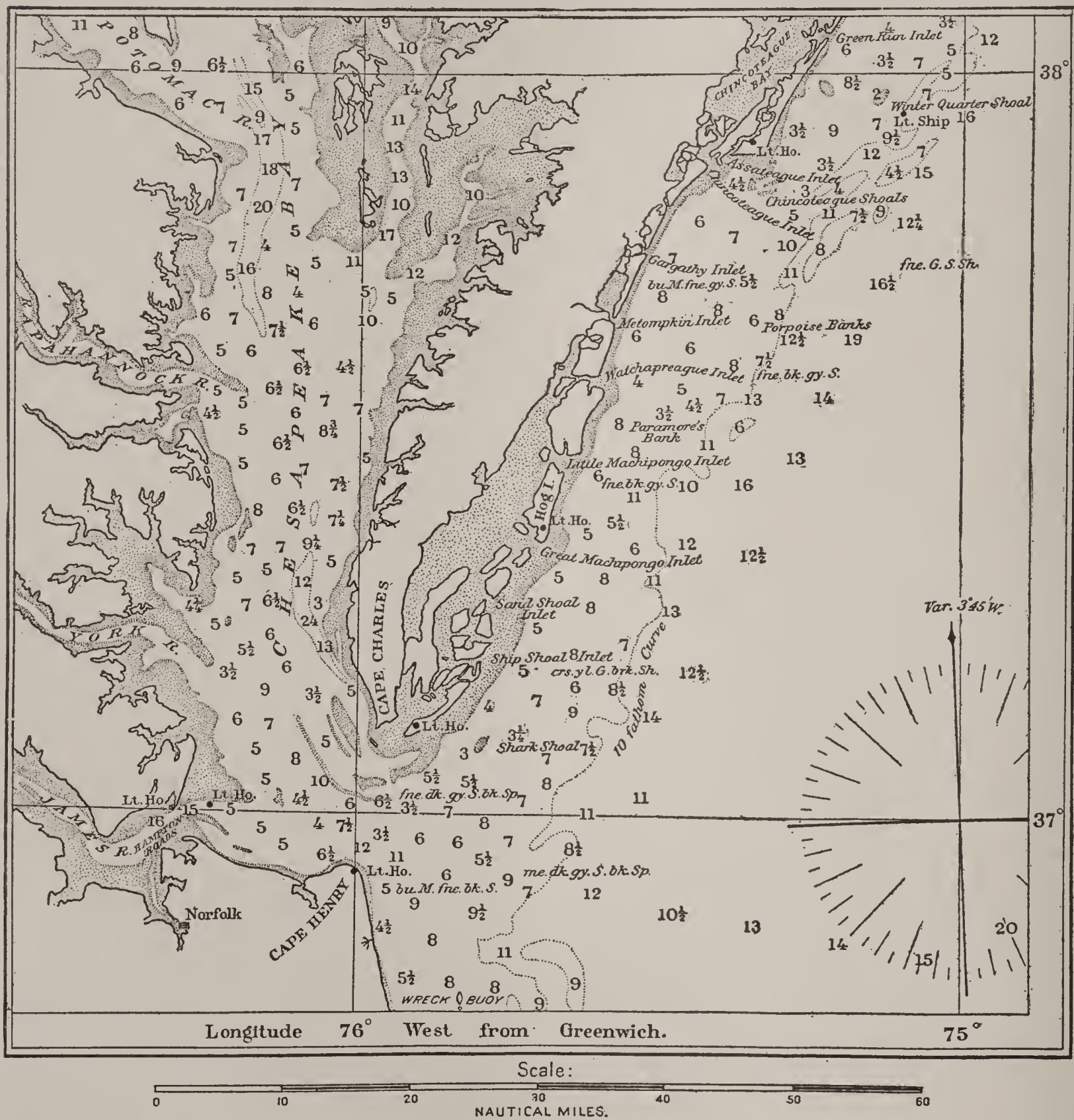
opposite directions, and if the results disagree beyond prescribed limits between adjacent bench marks, the leveling is repeated. The maximum discrepancy allowed between two measurements on a section 1.6 kilometers (1 mile) long is 5 millimeters or one-fifth of an inch. For sections of other lengths, the allowable discrepancy is made proportional to the square root of the length.

A much more severe test of accuracy is obtained from the closures of large circuits. In

now indicated by the circuit closures is 0.074 millimeters per kilometer, or about one two-hundredths of an inch per mile. This work is now executed at the average rate of 8.9 miles of single line per working day, at a cost ranging from 7 to 11 dollars per mile.

Leveling by vertical angulation consists of the determination of differences of elevation by the measurement of vertical angles. This work is carried on in connection with the work of triangulation, the angles of elevation or depres-

Portion of the United States Coast and Geodetic Survey "Sailing Chart"



the network of precise level lines which cover the eastern half of the United States at the present time, there are 50 large circuits, varying in circumference from 100 to 1,800 miles. The greatest error indicated in any line of the entire system of nearly 20,000 miles is 1.8 millimeters per kilometer, or about one-tenth of an inch per mile. The errors of closure have been still further reduced by the use of the new instrument already described, and the greatest error

of one or more distant stations being measured from any station. The sight varies in length according to the character of the region. In mountainous regions, under favorable meteorological conditions, they frequently exceed 100 miles. The distance to the station sighted being known, the difference of elevation between them is computed. The necessity of applying large corrections for refraction, a very variable factor, having different values diurnal and

COAST DEFENSE

seasonal, the laws of which are comparatively unknown, brings the accuracy of the results obtained by the method considerably below that of spirit leveling. Tests for accuracy in connection with precise leveling work indicate that vertical angulation gives results that are correct to within one inch to the mile.

Coast Pilots.—See COAST PILOTS.

Chart Publications.—See CHART.

The accompanying map is a portion of a "Sailing Chart" which as published embraces the Atlantic coast of the United States between Cape Cod and Cape Hatteras. It shows only the outline of the continent, the seacoast lights, and the special geographic information useful for the purposes for which the map is intended, namely, a guide to navigation in close proximity to the coastline.

Gravity.—The gravity work is now accomplished by the method and instruments suggested by Dr. T. C. Mendenhall, Superintendent of the Survey, in 1890, which permit of the accomplishment of the work with an ease and precision far superior to any of the methods previously used. See GRAVITY.

Geodesy.—See GEODESY; GEODETIC ARCS.

For the latest information on the different subjects consult the following publications of the Survey: Map Reductions, etc.: Appendix 20, Report for 1860; Magnetic Work, etc.: Appendices 8 of 1881, 1 of 1895, 5 and 6 of 1902, and 3 of 1904; Gravity: Appendices 12 of 1893 and 6 of 1897; 'Tides,' etc.: Appendices 7, 8, and 9 of 1897; Signals in Triangulation, etc.: Appendices 10 of 1882 and 4 of 1903; Triangulation: Appendix 9 of 1882; Plane Table Manual: Appendix 7 of 1905; Some Instruments: Appendix 8 of 1894; New Level: Appendix 6 of 1900; Astronomical Work: Appendices 7 of 1897-8, and 8 of 1904; Hydrography: Appendix 6 of 1905.

Coast Defense, systematic protection of a country against hostile attack along its coastlines. In providing such defense a nation will consider not only the safety of its territory, but also the security of its commercial interests. In any system of coast defense a good navy is the most important feature; and so essential is it considered, that all other means are regarded as adjuncts or auxiliaries of the navy. Along a well-defended coast, in suitable places, are stations or points of support where is stored the requisite material for building, equipping, repairing, and supplying naval vessels, and where provision is made for furnishing men when additional force is needed. Forts are built in places where the coast artillery may co-operate with the navy in obstructing the advance of an enemy intending to capture a city or to invade the country; where their guns may command the entrance to a harbor or other approach by water; wherever they may cripple the enemy's attack on the defensive fleet, leaving it free to attack the enemy in turn; where forts may assist each other, and co-operate in repelling an invasion or preventing a blockade or a bombardment; where minor channels of approach may be closed or guarded, thus enabling the navy to give entire attention to the main channel, etc. Torpedo-boats, harbor-mines, the searchlight, which illuminates the harbor and permits detection of the enemy's manœuvres, are all valuable aids for the forts. The unfortified coast, as well as the

land approaches to cities, must be defended in time of war by whatever means are at command.

The guns for coast defense change with the places and purposes for which they are to be used. To pierce the side armor of battleships, the flat trajectory, high-power guns are used; for projectiles intended to fall on the decks of an enemy's ships, the high-angle guns (mortars or howitzers) are employed. The number and size of guns vary with the estimated number and calibres of those which may be brought to bear by an enemy. From the depth and length of the channel may be determined how many and what classes of ships the enemy can operate in it, their armament, etc., and from these data the number and calibres of guns needed may be calculated.

The difficulty of obtaining naval supplies after war has been declared makes it necessary to store them during times of peace. Besides quantities of supplies at points of support for the navy, important harbors are generally equipped with torpedo storehouses, cable-tanks, mining casements, etc., for use in emergencies.

The tactics of coast defense have changed greatly since the beginning of the last decade of the 19th century. Besides defense against attack upon fortified places preparation is also necessary for resisting assaults upon unfortified coasts. The length of the United States coast-line makes its secure fortification a matter of great difficulty and expense.

Methods of reconnaissance are important for defense as well as for attack. The defense seeks to veil all batteries, and even in times of peace a journey along a fortified coast might not discover many forts or other means of defense. The enemy, in preparation for attack, or in action, seeks to discover the nature and strength of the defenses; and the defense in turn uses all possible methods of ascertaining the number and classes of the enemy's ships, the probable line of attack, and whatever else may be discoverable in regard to his strength and purposes. Pictures of every important warship in the world are studied by certain officers of every navy, and so close are some of these studies that a war vessel may be recognized by such an officer in any position in which he sees it. For the important work of reconnaissance observation stations are fully equipped for the coast artillery, photographs, drawings, descriptions of warships, telescopes, etc., for use in procuring information of the enemy, being fully provided.

In times of peace a country may, to its peril, neglect its coast defense, as was shown by the condition of the defenses of the United States at the beginning of the war with Spain. European nations have for years divided their tide-water regions into naval zones, and have assigned to each zone reserves, torpedo divisions, lighthouse establishments, coast-guard services, and signal stations.

In France the naval authority is made paramount, and all naval affairs are in charge of the minister of marine, assisted by a chief of staff. Not only the mobile defenses, but the coast fortresses, submarine mines, and the fort batteries are under control of the minister or his aid. In June, 1903, the general board of the United States navy made public the details of a plan for its reorganization with a general staff

COAST GUARD — COAST PILOTS

in several grand divisions, under a chief of staff, with the secretary of the navy, as now, at the head of the department.

In recent times the navies of all leading countries have been enlarged, forts multiplied and strengthened, and more attention given to training young men in the tactics and strategy of defense, involving immense increase of national expenditure. In this general advance of naval preparation our own country is now maintaining a steady and quickened pace, and questions of coast defense must here be solved with equal energy and intelligence. The work of providing a proper armament for the exposed harbors of the United States has been progressing as rapidly as the congressional appropriations would permit. Since the outbreak of the war with Spain, Congress has been more liberal with its provisions for pushing this work. According to the annual report of the United States board of ordnance and fortification for 1895, at the rate of progress then being made it would require 50 years of work to place the great stretch of seacoast in proper condition for defense. The board recommended an appropriation of \$2,000,000 for engineer work in the construction of implements, fortifications, etc., and one of \$5,000,000 for the construction of guns, mortars, gun-carriages, seacoast armament, and ammunition. Concerning future advancement, the board recommended that it be along the following lines: the development of smokeless powders; the development of a high explosive that can be safely discharged in a shell at a high velocity with certainty of detonation; the selection of armorplate for sea forts; the development of rapid-fire field and seacoast guns, and of an efficient system of fire control for harbor defenses. Recent reports show that satisfactory progress has been made in all these lines except that the use of armor-plates in forts has been abandoned for the more satisfactory earth and concrete emplacements. The bill making appropriations for the construction of fortifications and coast defenses in the year ending 30 June 1900, carried a total of \$4,744,798. The department submitted estimates for works to cost \$12,151,898. In the 11 years from 1889 to 1899 inclusive Congress appropriated for these purposes \$48,761,747. The bill for the year 1898-9 carried \$9,377,494, and the further sum of \$8,674,898 was provided in deficiency acts. In addition \$12,865,841 was allotted for the same object out of the \$50,000,000 appropriation for the national defense, making a total of \$30,988,233 made available for fortifications and the armament thereof at that critical period.

The total appropriations made for fortifications and other works of defense since 1888 amounted in 1900 to \$77,000,000. In April, 1900, the secretary of war issued a general order to the army announcing the names of 56 new batteries that had been recently constructed and the sites for works yet to be constructed along the seacoast.

The reorganization of the control of the coast defenses of the United States has embraced more thorough and systematic information regarding this branch of service. In one of its recent orders the navy department gives the following instructions: "As a part of the scheme of naval defense each district will provide means of obtaining and forwarding information to and from the coast, and of communicating with ves-

sels of our own navy, and this system, as a whole, shall be designated as the naval patrol."

The sea and lake coasts of the United States have been divided into 13 naval districts. Torpedo boats are to be part of the defense of each district, and torpedo-boat bases will be established in them. Each district is to be in charge of an officer known as commandant. The districts follow:

1. Eastport, Me., to include Chatham, Mass.; torpedo-boat base, Rockland; commandant of the Portsmouth navy yard in charge.

2. Chatham to include New London, Conn.; torpedo-boat base, Narragansett Bay; officer specially detailed from Narragansett Bay headquarters in charge.

3. New London to include Barnegat, N. J.; officer detailed from headquarters in New York in charge.

4. Barnegat to include Assateague, Va.; torpedo-boat base, Delaware River; commandant of League Island navy yard in charge.

5. Assateague to include New River Inlet, N. C.; torpedo-boat base, Norfolk; commandant of the Norfolk navy yard in charge.

6. New River Inlet to include Jupiter Inlet, Fla.; torpedo-boat base, Charleston; commandant of Charleston navy yard in charge.

7. Jupiter Inlet, to include Tampa, Fla.; torpedo-boat bases, Tampa and Pensacola; commandant of Key West naval station in charge.

8. Tampa, to include Rio Grande; torpedo-boat base, lower Mississippi and West Gulf coast; commandant of Pensacola navy yard in charge.

9. Lake Michigan. 10. Lakes Erie and Ontario. 11. Lakes Huron and Superior. All these in charge of the commandant of the Lake training station near Sheboygan, Wis.

12. Southern boundary of United States on Pacific coast to lat 42° N.; torpedo-boat base, Mare Island; commandant of Yerba Buena training station in charge.

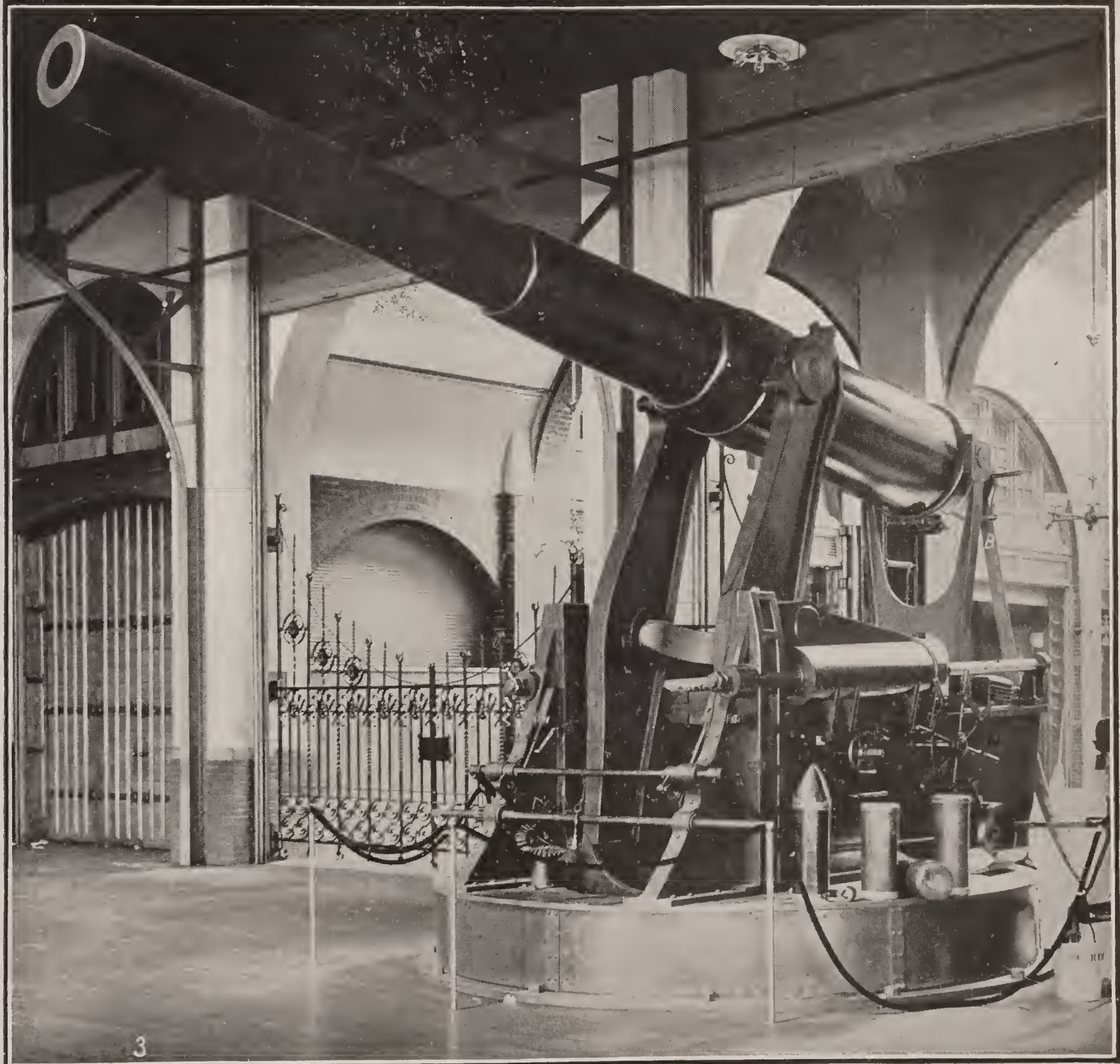
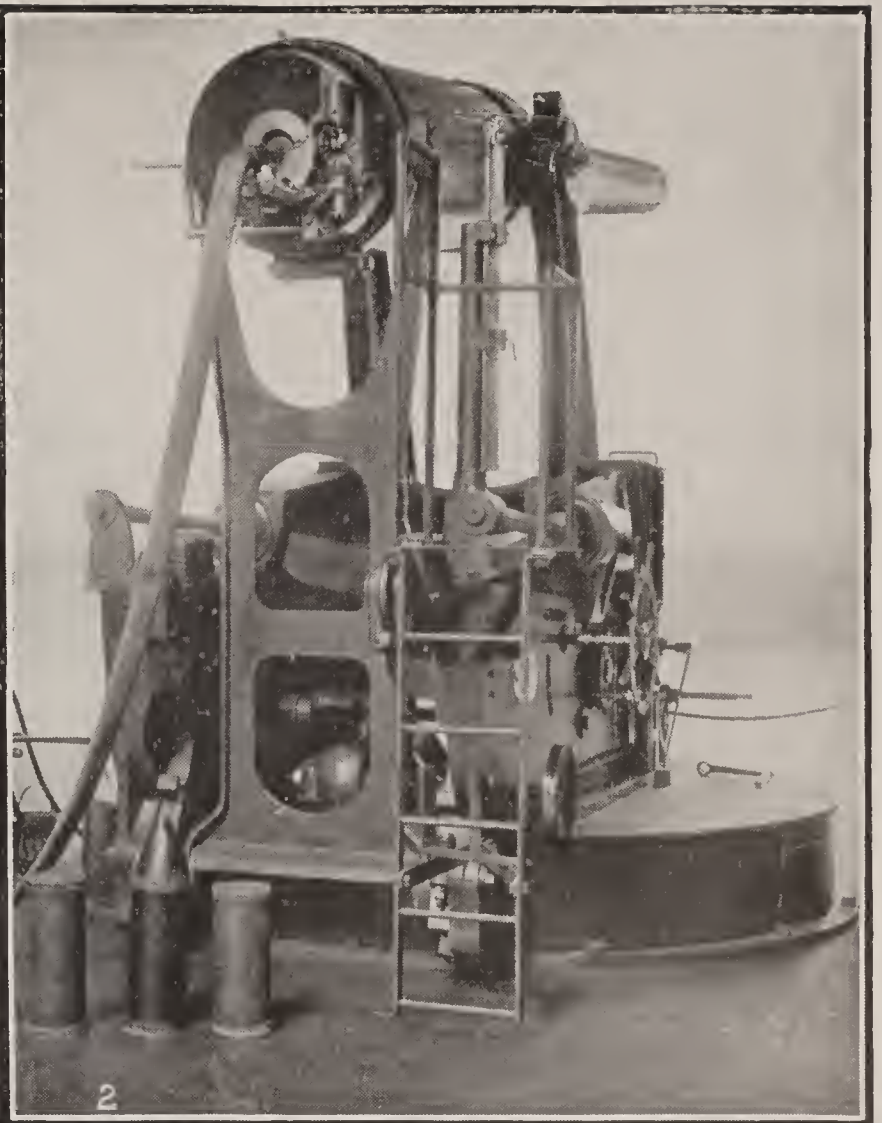
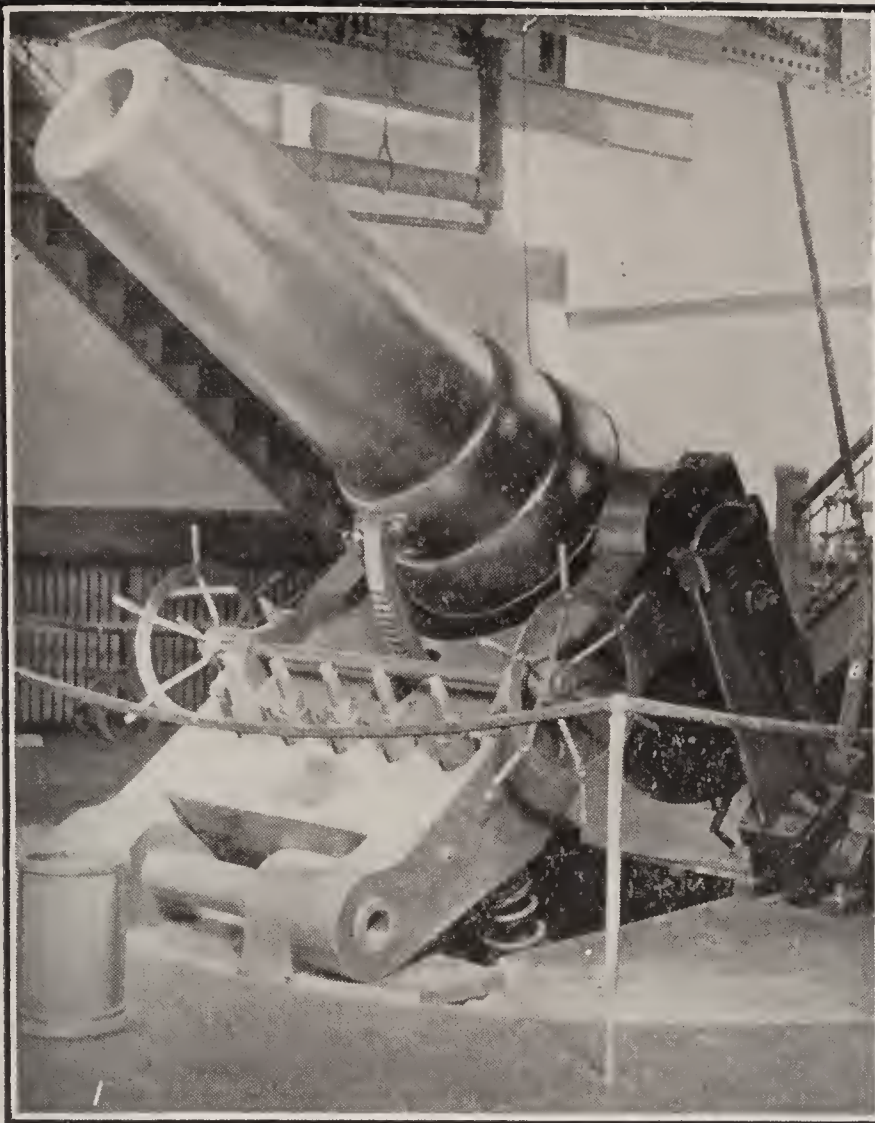
13. Pacific coast from lat. 42° N. to northern boundary; torpedo-boat base, Puget Sound; commandant of Puget Sound navy yard in charge.

Information collected in these districts is to be sent to the office of naval intelligence. In time of peace the aide to the commandant, or some other line officer, is to be second in command in each district; in time of war lighthouse inspectors are to be second in command. See BLOCKADE; BOMBARDMENT; FORTIFICATION.

Coast Guard, a British force formerly under the customs department, and intended only to prevent smuggling, but now organized also for purposes of defense and governed by the admiralty. The men, who are generally old men-of-war's men of good character, have high pay and are furnished with free cottages. The force numbers, with officers and men, about 4,000.

Coast Pilots are compiled to assist mariners in the navigation of their vessels, and, when from any cause they are without charts, to enable them to safely carry their vessels from port to port along the coast. The governments of all large maritime nations publish works for these purposes.

As early as 1796 a volume known as 'The American Coast Pilot', by Capt. Lawrence Furlong, was published in Newburyport, Mass., by Edmund M. Blunt, and the first edition met



¹ A 12-Inch Mortar. ² Rear View of 8-Inch Gun Showing Compressed-Air Attachment and Dummy Shell.
³ Working Model of 8-Inch Gun.

SHELL PRACTICE WITH MODERN COAST-DEFENSE GUNS IN A CITY ARMORY

COASTAL PLAIN

with so ready a sale that a second edition of the same work was published in 1798. Since the latter date numerous compilers have published coast pilots of the coast of the United States and its harbors. These works were compiled from charts, from reports by shipmasters published in the newspapers, and from surveys and the personal knowledge of the compilers, some of whom were experienced shipmasters.

The vessels of the Coast and Geodetic Survey, while engaged in surveying the coast and harbors of the United States, collected much information of importance to mariners which could not be shown on the charts or completely given in 'Notices to Mariners.' 'Coast Pilots' are published and distributed by the Coast and Geodetic Survey at the cost of the printing and binding. Similar information can not be collected by private enterprise except at great cost and with imperfect means, and at the present time all the private publications containing such information relating to the coast of the United States are compilations from government publications and based generally on the work of the Coast and Geodetic Survey.

The compilation of the 'Coast Pilots' necessitates work in the office and in the field. The office work consists of the collection of the latest data from the reports and surveys of hydrographic and topographic parties, from the reports and surveys of the United States engineers engaged in the improvement of harbors and waterways, and from correspondence with local authorities and engineers. This information, in manuscript, is then put in the form of a volume which experience has shown to be convenient for the use of the mariner.

For the field work a vessel of the survey, with the compilers of the 'Coast Pilot' on board, visits every part of the coast which is treated in the volume; the information collected in the office is verified and, if necessary, corrected on the spot; the sailing lines and directions are tested by running over them; such artificial aids and natural landmarks as are of use to the mariner are noted, and hydrographic examinations of reported dangers and changes are made; pilots, shipmasters, and local authorities are interviewed and the latest information is incorporated, together with such notes as can only be obtained by observation and experience in the locality.

On returning to the office from the field work this manuscript, correct to date, is prepared for the printer, and when printed the volumes are issued with a supplement or insertion sheet containing the changes which have occurred since the date of the preparation of the volume and while the matter was going through the press.

The 'Coast Pilots' published by the coast and geodetic survey contain:

1. A tabular description of lighthouses, light vessels, and fog signals; lists of life-saving stations, storm-warning display stations, and sea-coast telegraph stations, and information regarding tides, tidal currents, variation of the compass, etc.

2. Nautical descriptions of the coast and harbors and general information concerning the several bodies of water and harbors, including notes relative to pilots, depth of water, draft of vessels entering the harbor, supplies; facilities for making repairs, usual or best anchorage,

and other matters of practical value. In each case the information of this nature precedes the sailing directions and is printed in smaller type.

3. Sailing directions, with subordinate paragraphs treating of prominent objects, dangers, aids to navigation, etc. The arrangement conforms to the order in which these matters would be considered in practice, and be available when wanted promptly. For this purpose, and to afford a ready means of reference from one part to another, the sailing directions, where long, are divided into numbered or lettered paragraphs, printed in large type, each followed by its own subordinate remarks in smaller type.

4. Appendices, containing rules of the road at sea and in inland waters; laws and regulations relative to pilotage, harbor control, national and local quarantine, and Marine Hospital service; and information regarding storm-warning displays.

5. Views of important points. These are only inserted in volumes which treat of localities which have not yet been surveyed or where the lighthouses and other aids to navigation are not sufficiently numerous to readily locate and navigate a vessel.

6. Sections of charts covering the coast treated in the volume to aid in finding the geographic positions of different localities. Index maps showing the limits of the charts covering the localities treated in the volume.

The 'Coast Pilot' publications of the United States Coast and Geodetic Survey include:

Seven volumes of the 'United States Coast Pilot, Atlantic Coast', in eight parts as follows:

Parts I-II. From St. Croix River to Cape Ann.

Part III. From Cape Ann to Point Judith.

Part IV. From Point Judith to New York.

Part V. From New York to Chesapeake Bay Entrance.

Part VI. Chesapeake Bay and Tributaries.

Part VII. From Chesapeake Bay Entrance to Key West.

Part VIII. Gulf of Mexico, from Key West to the Rio Grande.

One volume of the 'Pacific Coast Pilot'; California, Oregon, and Washington.

One volume of the 'Pacific Coast Pilot; Alaska, Part I, Dixon Entrance to Yakutat Bay, with Inland Passage from Strait of Fuca to Dixon Entrance'.

In addition to the above 'Coast Pilots', bulletins containing the latest information obtainable from all sources about the little known waters of northwest Alaska and Bering Sea are published for the use of mariners navigating those waters.

It is manifest that publications of this character must be subject to numerous corrections in the details after the lapse of a few years. To maintain the volume in a useful form corrections are issued in 'Notices to Mariners,' insertion sheets, and supplements; and each volume is revised and passed to a new edition when the corrections have assumed proportions that impair its usefulness, or more recent surveys show changes or furnish additions that render the old volume untrustworthy.

Coastal Plain. Where the foothills of a range of mountains descend to a lowland that slopes gently to the sea, this lowland is called

COAST RANGE

a coastal plain. It represents what was once the sea floor, being composed of material eroded from the mountains and deposited in the sea. With further elevation the original surface of the plain may be removed by streams cutting their valleys and by the weathering of the valley slopes. The coastal plain of the Atlantic Seaboard extends from New York to Georgia. In the Carolinas and Georgia it is divisible into belts parallel to the shore. The outer is a smooth plain, often swampy, perhaps 50 miles wide with a gently rolling surface. Further inland, where the streams have cut valleys, the surface is more hilly, and 100 miles inland is a belt of hilly country some 600 or 700 feet high covered with pine forests where the original surface of the plain has been nearly destroyed. Back of this come the higher hills, formerly mountains, of the old land, forming what is known as the Piedmont belt. Other instances of coastal plains are the east coast of Mexico, north and south of Vera Cruz, and the east coast of India, skirting the Bay of Bengal.

Coast Range. The Pacific shore of the United States rises abruptly from the ocean along nearly its whole length, with practically no coastal plain of any size from southern California to the Strait of San Juan de Fuca. The hills and low mountains which border the ocean are given the general name of the Coast Range. They do not form, however, a continuous ridge, but are rather parts of more or less disconnected uplifts, lower and possibly younger than the Sierra Nevada and Cascade ranges. North of the Strait of San Juan de Fuca the mountains of Vancouver Island and the Island range of British Columbia mark the continuation of these uplifts, although in British Columbia the name of Coast Range is given to the mountains which border the continental shore and are spurs of the Cascades.

In California the coast range comprises two parallel ridges, 400 miles long, 30 to 60 miles apart, and parallel to the coast from Point Concepcion in lat. 35° to Cape Mendocino, the ridge on the coast being the coast range proper, and the inner the Monte Diablo range, the two separate the Sacramento and San Joaquin valleys from the Pacific. In the south the coast ranges and the Sierra Nevada coalesce and the topography is complicated by east and west ranges; thus opposite the Santa Barbara channel is the Santa Inez range, having a height of about 4,000 feet, and farther south is another east-and-west range, the Santa Monica. Still further south the uplift is much broken and irregular without strongly marked ridges but with portions rising into central dominating points like the San Bernardino and San Jacinto mountains, about 11,000 feet high.

North of lat. 35° , toward San Francisco Bay, there are no very high peaks. The highest peaks near the bay are Monte Diablo, 3,856 feet, an isolated peak that is a conspicuous landmark for miles; Mount Helena, 4,343 feet; and Mount Hamilton, 4,400 feet, the latter famous as the site of the great Lick observatory. North of San Francisco Bay the heights of the summits gradually increase, and 150 miles north is Mount Bailey, 6,357 feet. Farther north the coast range becomes gradually a series of disconnected mountain groups, and near the Oregon line east-and-west ridges develop which unite

with the Cascades, the most important of these being the Calapooia Mountains in Oregon.

Along the Oregon coast the uplift is low, being generally less than 3,000 feet. In Washington also the uplift is not great except in the Olympic Mountains between Puget Sound and the Pacific Ocean, which culminate in the fine peak of Mount Olympus, 8,150 feet.

Extending along such a length of coast, the coast ranges have a wide variety of climate and differ much in vegetation and attractiveness. In California, north of lat. 38° to San Francisco Bay, much of the outer range is covered with brush and has some timber. South the mountains are covered with a thorny undergrowth known as chaparral. Near the coast, from Santa Barbara to San Francisco, there is a fair rainfall in the interior. The climate is very dry, and the mountains are generally bare. North of San Francisco Bay the rainfall increases, and the mountain valleys are fertile and picturesque. In Oregon the rainfall is heavy, and in Washington very heavy; the mountains being covered with thick forests of fir, pine, and spruce.

Geologically the mountains of the coast uplifts, besides being newer than the Sierra Nevada and Cascades, are also less broken through by granite than the Sierra Nevada, and less covered by lava than the Cascades. The upheaval began in late Tertiary time, and perhaps continued into the Quaternary, Pliocene rocks being upturned at a high angle near San Francisco Bay. South of San Francisco Bay the rocks are mostly of the Miocene series, though there are large areas of Cretaceous in the east side of the Monte Diablo belt. North of San Francisco Bay and in Oregon the proportion of Cretaceous increases, and the Tertiary is much less. On Vancouver Island an uplift took place in Jurassic time.

Generally speaking, the rocks of the coast range in California are much metamorphosed, and large masses of serpentine and similar rocks are not uncommon. In places these serpentines sometimes contain workable deposits of chrome iron ore, though, owing to the limited demand, the production is small. The chief mineral wealth of the coast range is in quicksilver and petroleum, though some gold has been washed from placers in southern California. The quicksilver occurs at a number of places in the range where the altered rocks are silicified, and the total production, though the ore is generally of low grade, has been large.

South of San Francisco Bay, in the Miocene, in places is a great thickness of bituminous shale, there being several thousand feet of it near Santa Barbara and Los Angeles. This shale has been used extensively as a material for paving streets. Within the past eight years a valuable oil-field has been developed near Los Angeles. But little coal has been found in the range in California, and that is of poor quality. In Oregon is the Coos Bay field.

In Oregon and Washington the coast range contains very few mineral deposits of importance. On Vancouver Island, however, promising copper deposits are being developed on the west coast, and on the east coast are large and important coal mines.

The coast range naturally has no river systems, nor, except in California, is it a barrier to rivers of the interior. It is crossed by the

COASTING TRADE — COBALT

Columbia, Coquille, Rogue, Klamath, and other rivers.

For mineral resources of the range see COAL; PETROLEUM. See also BRITISH COLUMBIA; CALIFORNIA; OREGON; WASHINGTON.

Coasting Trade, trade carried on by sea between the ports of the same country. In some countries the coasting trade is retained as a home monopoly, and this used to be the case in the United Kingdom, but by recent laws the coasting-trade of Great Britain has been opened to foreign vessels, subject to the same rules, dues, and regulations as British sailing ships and steamers; but power was given to impose by an order in council retaliatory prohibitions and restrictions on the ships of such countries as should impose restrictions and prohibitions on British ships. The dues and regulations to which vessels engaged in the coasting trade are subject are different from those which relate to vessels engaged in the oversea trade, and masters are required to keep books showing that their cargoes are strictly such as are allowable by the rules of the coasting trade. In the United States the coasting trade is restricted to vessels belonging to the country. The commerce of the Great Lakes is included in the coasting trade. The great length of the sea and lake coasts, the number of good harbors, and the fact that much of the coast region of the United States has been settled makes the coasting trade of this country the most extensive in the world. Many hundreds of sailing craft and steamers are used in this trade, carrying the products and people of one part of the country to other parts. This trade is increasing rapidly, the licensed tonnage of fisheries and trade in 1900 was 4,338,145 tons, an increase of nearly 1,250,000 tons in the preceding 50 years. The annual amount of tonnage passing through St. Mary's Falls Canal is much larger than that of the annual tonnage of the Suez Canal, and the amount passing through St. Clair River is about four times that recorded at St. Mary's Falls Canal.

Coat of Arms, heraldic insignia, originally embroidered on the tabard, a short coat worn by knights over the armor. They originated in the age of chivalry, when they were assumed as emblematic of the adventures, and hopes of the knight and were useful for distinguishing individuals whom it was difficult to recognize when in full armor. The favorite emblem of the knight later became the adopted badge of the family, the figures or characters employed in the coat of arms began to receive names, and so the language and science of heraldry came into existence. Modern nations have adopted coats of arms, in monarchical countries, sometimes an adaptation of the heraldic insignia of a dynasty. The coats of arms of the United States and of the individual States are arbitrarily adopted emblems without true heraldic significance. The emblem of a State sometimes represents its leading industry; some cities have also adopted similar coats of arms. See HERALDRY.

Coat of Mail, a piece of armor in the form of a shirt, consisting of a close net-work of iron or steel rings, or of a strong linen or leather jacket covered with small laminæ or plates, usually of tempered iron, overlapping each other like the scales of a fish. See ARMS AND ARMOR.

Coatbridge, kōt'brīj, Scotland, a municipal burgh in Lanarkshire, nine and a half miles east of Glasgow. It owes its rise to the working of the coal and iron-stone found in the surrounding district, and has grown rapidly from a village to a thriving town. The chief manufacturing interests are the numerous iron works in the town and neighborhood, about half of the blast-furnaces of Scotland being situated in this locality. There are also important engineering establishments and other industries. Pop. (1901) 36,981.

Coates, Florence Earle, American poet: b. Philadelphia, Pa., 1 July 1850. In 1879 she was married to Edward Hornor Coates. She has made many contributions to various magazines and published her collected 'Poems' in 1899.

Coates'ville, Pa., a borough of Chester County, situated on the Pennsylvania and the Wilmington & No. R.R.'s. It has a number of important industrial interests, including large boiler works, iron and steel works, foundries, and woolen and paper mills. Pop. (1900) 5,721.

Coati, an American animal somewhat related to the raccoons, of which two species are known, constituting the genus *Nasua*. One inhabits Mexico and roves as far north as southern Arizona; the other lives in Brazil. The Mexican coati, or "coati-mundi" (*N. nasica*) is about the size of a house-cat, has a long cartilaginous snout which may be reflexed or stiffened at will, according to its owner's needs. Its fur is long, thick, and a warm brown in color; and its tail is ringed like that of a raccoon. The Brazilian coati (*N. rufa*) is somewhat smaller than the Mexican, and its fur is not so fine. Both species feed on fruits, eggs, insects, and sometimes on small birds. They are readily tamed, and make as good pets as the domestic cat.

Coaticook, kō-āt'i-kuk, Canada, a town of Stanstead County, Quebec, situated on the Coaticook River, and the Grand Trunk R.R. It has a number of factories and is a manufacturing centre. Pop. 3,000.

Coatzacoalcos, kō-āt-sa-kō-āl'kōs, a river of the isthmus of Tehuantepec in Mexico, rises in the Sierre Madre, and empties into the Gulf of Mexico, 130 miles southeast of Vera Cruz. It is navigable for large vessels for 30 miles, and is interesting as part of a route which has been surveyed for an inter-oceanic canal, a city of the same name, with a population of about 3,000, is situated at the mouth of the river.

Cobalt, a metal which occurs combined with arsenic, nickel, and other metals; also as a sulphide and as an arsenate. After the ore has been calcined, oxide of cobalt remains, but impure from the presence of other metallic oxides. When this oxide has been purified and reduced to the metallic state the cobalt is obtained of a white color inclining to gray, and, if tarnished, to red, with a moderate lustre. Its fracture is compact; it is hard, brittle, and of a specific gravity of 8.5 to 8.9. Like nickel, it is strongly magnetic. It undergoes little change in the air, but absorbs oxygen when heated in open vessels. It is attacked, though slowly, by sulphuric or hydrochloric acid, and is readily oxidized by means of nitric acid. Two basic oxides of cobalt are known, and some inter-

COBALT-BLUE — COBB

mediate oxides. The protoxide is of an ash-gray color, and is the basis of the salts of cobalt, most of which are of a pink hue. When heated to redness in an open vessel it absorbs oxygen and is converted into a higher oxide. It may be prepared by decomposing the carbonate of cobalt by heat in a vessel from which atmospheric air is excluded. It is easily known by its giving a blue tint to borax when melted with it. It is employed in the arts, in the form of smalt, for communicating a similar color to glass, earthenware, and procelain. *Smalt*, or powder blue, is made by melting three parts of fine white sand, or of calcined flints, with two of purified pearl-ash and one of cobalt ore previously calcined, and ladling it out of the pots into a vessel of cold water; after which the dark-blue glass, or zaffer, is ground, washed, and distributed into different shades of color, which shades are occasioned by the different qualities of the ore and the coarser or finer grinding of the powder. Smalt, besides being used to stain glass and pottery, is often substituted, in painting, for ultramarine blue, and is likewise employed to give to paper and linen a bluish tinge. The chloride of cobalt is well known as a *sympathetic ink*. When diluted with water so as to form a pale pink solution, and then employed as ink, the letters, which are invisible in the cold, become blue if gently heated. It is prepared by dissolving precipitated oxide of cobalt in hydrochloric acid with the aid of heat, and diluting with water. The nitrate of cobalt is readily got by dissolving cobalt or its oxide in nitric acid and crystallizing the solution. It is a deliquescent red salt, which dissolves in water with a pink color. The peroxide of cobalt is black, and is formed by adding a solution of bleaching-powder to a cobaltous salt, or by passing a current of chlorine gas through water holding cobaltous hydrate in suspension. It does not unite with acids; and when digested in hydrochloric acid the cobaltous chloride is generated with the disengagement of chlorine. When heated it is converted into one of the intermediate oxides.

Ores of Cobalt.—“Bright white cobalt ore” is the popular name for the mineral cobaltite (q.v.), a sulph-arsenide of cobalt. “Gray cobalt ore,” also sometimes called “tin-white cobalt,” is the mineral smaltite (q.v.). It is the chief ore of cobalt and is essentially cobalt diarsenide, though it always contains nickel and iron. “Red cobalt,” also known as “cobalt-bloom,” is the mineral erythrite (q.v.), a hydrous cobalt arsenate. “Earthy cobalt,” or “black cobalt,” is the mineral asbolite, a variety of wad containing up to 32 per cent. oxide of cobalt. “Cobalt pyrites” is the mineral linnæite, a sulphide of cobalt, often containing much nickel. The principal supply of cobalt is derived from the smaltite of Germany and the cobaltite of Norway and Sweden.

Cobaltite, “bright-white cobalt,” an important ore of cobalt, is its sulph-arsenide, CoAsS , and contains 35.5 per cent. of cobalt. It occurs granular massive, but also in isometric-pyritohedral crystals. These usually have a brilliant metallic lustre and a white color slightly tinged with copper-red. Their hardness is 5.5 and specific gravity 6 to 6.3. The most important localities are in Norway and Sweden.

Cobalt'-blue, or **Thenard's Blue**, a compound of alumina and oxide of cobalt, forming a beautiful pigment often used in the arts. Some-

times it contains also the phosphate or arsenate of cobalt, according to the mode of manufacture employed. It is non-poisonous, and unacted on by acids and alkalies.

Coban, *kō-bän'*, or **Vera Paz**, Guatemala, a city 90 miles northeast of the city of Guatemala. It is the capital of the department of Vera Paz, on the left bank, and near the source of the Dulce or Dolce. It was formerly a mission station of the Dominicans, whose memory is still revered. The Dominican monastery is now deserted. The valley is exceedingly fertile, and covered with plantations of sugar-cane, bananas, and pimento trees, and various kinds of fruit-trees. Pop. about 30,000.

Cobb, Henry Ives, American architect: b. Brookline, Mass., 19 Aug. 1859. He studied at the Massachusetts Institute of Technology, and graduated at Harvard 1880. In 1881 he established himself in Chicago, and has built up a large and lucrative general practice in that city and other parts of the country. In 1893 he was one of the national board of architects of the World's Columbian Exposition, and at present is retained as a special architect for the United States government. Among the prominent public buildings erected from his designs are, the Newberry Library, Chicago, opera house, University of Chicago, and Church of the Atonement, in Chicago; the Pennsylvania State Capitol, American University at Washington, D. C., and government buildings at Chicago, League Island, Annapolis, etc.

Cobb, Howell, American statesman: b. Cherry Hill, Ga., 7 Sept. 1815; d. New York City, 9 Oct. 1868. He was graduated at Franklin College in 1834, became a lawyer in 1836, and in 1843 was elected to Congress as a Democrat. He served eight years and was speaker of the House one term. Elected governor of Georgia in 1851, he returned to Congress in 1855, and was made secretary of the treasury by President Buchanan in 1857, resigning in 1860 to urge secession. He held a Confederate military commission in the Civil War, but saw little service.

Cobb, Sylvanus, American novelist: b. Waterville, Maine, 1823; d. Hyde Park, Mass., 2 July 1887. He was editor and publisher of a periodical called the ‘Rechabite’, and besides contributing to other publications, was a most prolific story-writer. His most popular novels are: ‘The King's Talisman’ (1851); ‘The Patriot Cruiser’ (1859); and ‘Ben Hamed’ (1864); ‘The Gunmaker of Moscow’.

Cobb, Thomas Reed Root, American lawyer and soldier: b. Cherry Hill, Jefferson County, Georgia, 10 April 1823; d. Fredericksburg, Va., 13 Dec. 1862. He graduated at the head of his class at the University of Georgia, 1841, was admitted to the bar, and was reporter of the Georgia supreme court 1849-57. As a lawyer he enjoyed a wide reputation and large practice. In the Confederate Congress he was chairman of the Committee on Military Affairs, but later became a general in the army and was killed at the battle of Fredericksburg. He wrote: ‘Digest of the Statute Laws of Georgia’ (1851); ‘Inquiry Into the Law of Negro Slavery in the United States’ (1858); ‘Historical Sketch of Slavery from the Earliest Periods’ (1859).

Cob'ban, James Maclaren, Scottish novelist: b. Aberdeen, Scotland, 24 April 1849. He is the author of 'The Cure of Souls' (1879); 'Tinted Vapors' (1885); 'Master of His Fate' (1890); 'A Reverend Gentleman' (1891); 'Sir Ralph's Secret' reprinted in America as 'The Horned Cat' (1892); 'The Red Sultan' (1893); 'The Burden of Isabel' (1893); 'The White Kaid of the Atlas: a Boy's Story' (1895); 'The King of Andaman' (1895); 'Wilt Thou Have This Woman?' (1896); 'Her Royal Highness' Love Affair' (1897); 'The Angel of the Covenant' (1898); 'Pursued by the Law' (1899); 'An African Treasure' (1899); 'Cease Fire!' (1900); 'I'd Crowns Resign' (1900); 'The Golden Tooth' (1901); 'The Green Turbans' (1901); 'Life and Deeds of Earl Roberts' (1901); 'The Last Alive' (1902); 'Julius Courtney'; 'Royal Exchange'.

Cobbe, köb, Frances Power, Irish rationalistic writer: b. Dublin 4 Dec. 1822; d. London, Eng., 5 April 1904. She took a deep interest in the anti-vivisection crusade and for 18 years acted as honorary secretary of the Victoria Street Society for the Protection of Animals from Vivisection. Some of her works are descriptions of her travels in Italy, Greece, Egypt, and Palestine, the others treating mainly of theological, religious, and humanitarian questions. The most important are: 'Essay on Intuitive Morals' (1855); 'Religious Duty' (1857); 'Pursuits of Women' (1863); 'Broken Lights: an Inquiry into the Present Condition and Future Prospects of Religious Faith' (1864); 'Hours of Work and Play' (1867); 'Dawning Lights' (1868); 'Darwinism in Morals' (1872); 'The Hopes of the Human Race Hereafter and Here' (1874); 'Duties of Women' (1880); 'The Peak in Darien' (1882); 'The Scientific Spirit of the Age' (1888); and 'The Modern Rack' (1889). She also wrote an enormous number of pamphlets and edited an edition of the works of Theodore Parker.

Cobbett, köb'ët, William, English writer and politician; was the son of a farmer and publican: b. Farnham, Surrey, 9 March 1762; d. near Guildford 18 June 1835. In 1783 he set out to try his fortune in London, and arrived there with only a half a crown in his pocket. He succeeded in obtaining a situation as copying-clerk to an attorney of Gray's Inn, where he remained for nine months. Determined to find some other sphere of employment he quitted London for Chatham, enlisted in the 54th Regiment, and after continuing there for a year proceeded with it to New Brunswick. During his stay at Chatham he set himself assiduously to study and the improvement of his mind. He remained four years in America, during which time his regular habits and ability and attention in the discharge of his military duties effected his promotion to the rank of sergeant-major. In 1791 he returned to England with the regiment, and shortly after arriving there obtained his discharge. After a short stay in England, and a stay of six months in France in 1792, he embarked at Havre for America. He landed in New York in October, 1792, and continued in America for eight years, where he occupied himself with literary labors, chiefly of a political kind, commencing his career by an attack on Dr. Priestley, then recently landed in America, in

a pamphlet entitled 'Observations on the Emigration of a Martyr to the Cause of Liberty', and signed "Peter Porcupine". Under this famous *nom-de-plume* a succession of papers appeared, all of a strongly anti-Republican tendency, which were afterward republished in England. Before leaving America he published a life of 'Thomas Paine'. In June, 1800, he sailed for England, and on his arrival started the 'Porcupine', which zealously supported the measures of Pitt, but met with little success. In a subsequent paper, the 'Weekly Register', he was more fortunate; and it continued to appear regularly every week up to the period of his death. Not long after its commencement symptoms of a gradual change began to appear in Cobbett's political opinions, and from high conservative he passed over to extreme radical principles. In 1803 a prosecution for libel on the lord-lieutenant and other officers of state in Ireland was instituted against him, and resulted in his being sentenced the following year to a fine of \$2,500; while a second action, brought almost immediately afterward, subjected him to a second fine of the same amount. In 1810, owing to some remarks of his in the 'Register' of 10 July 1809, on the flogging of some militiamen, he was again prosecuted for libel, and sentenced to imprisonment for two years and a fine of \$5,000. This last was paid by a subscription among his friends. Nowise daunted, he continued his attacks on government as soon as he was liberated, and commenced his celebrated 'Twopenny Trash', which reached a sale of 100,000, and from its supposed influence on the working-classes brought about the passing of the noted Six Acts. Partly to escape their operation, he retreated to the United States, and remained here for two years, residing principally in Long Island. He returned to England in 1819, and in 1820 endeavored, unsuccessfully, to be returned member for the city of Coventry. About the same period he commenced in the 'Register' a series of papers entitled 'Rural Rides', afterward reprinted, which present most charming pictures of English country scenery, and are among the best of his productions. In 1824-27 he published a 'History of the Protestant Reformation in England and Ireland', in which he vilified Queen Elizabeth and the leading reformers, but added in no way to his literary reputation. The work was eagerly adopted by the Roman Catholics, who caused translations to be made of it into various European languages. In 1831 he was again prosecuted for libel, on the ground of an article in the 'Register' alleged to be published with the view of exciting the agricultural laborers to acts of violence. He conducted his own defense in a speech of six hours, and the jury not being able to come to a verdict the trial ended in their discharge. On the passing of the reform bill in 1832 Cobbett was returned member to Parliament for Oldham; but his success in this capacity was indifferent. Nevertheless, at the general election in December, 1834, he was again returned to Parliament for Oldham. In addition to the writings already referred to Cobbett is the author of an English and a French Grammar; 'Advice to Young Men and Women', containing many useful hints; 'Cottage Economy'; 'Village Sermons'; 'A Year's Residence in America'; and other works. Cobbett wrote in a pure and vigorous English style, and his

COBDEN — COBLENTZ

writings contain a great amount of information and sound practical advice. See E. Smith, 'Life of Cobbett' (1878).

Cob'den, Richard, English economist, the great "apostle of free trade": b. Dunford, Sussex, 3 June 1804; d. London 2 April 1865. After receiving a very meagre education at the grammar-school of Midhurst, he was taken as an apprentice into a Manchester warehouse in London belonging to his uncle, where he rapidly made up for the defects of his education by his own diligence, and soon acquired a thorough acquaintance with the business. In 1830, being left to his own resources, he obtained some advances of money, and, with some relatives, started a cotton manufactory in Manchester, which in a few years succeeded in producing fabrics equal in point of quality to the best manufactured in London. By several journeys that he now made to France, Belgium, Switzerland, and the United States, chiefly in the interest of the firm, he not only increased his business connections, but matured and enlarged his views. His first political writing was a pamphlet on England, Ireland, and America, which was followed by another on Russia. In both of these he gave clear utterance to the political views to which he continued through his life rigidly to adhere, rejecting the course of policy based upon the theory of the balance of power, advocating non-intervention in the disputes of other nations, and maintaining it to be the only proper object of the foreign policy of England to increase and strengthen her connections with foreign countries in the way of trade and peaceful intercourse. These views, although disregarded or considered as visionary in Parliament were warmly received in industrial and commercial circles, and secured Cobden a considerable number of followers, especially in Manchester. After returning from extensive travels in the East and in Germany, he entered actively on a course of agitation with the view of carrying into effect his political views. Soon after the Anti-Corn Law League was formed in 1838, it was joined by Cobden, who expended all his energies on behalf of the cause to support which the league had been founded; and it was chiefly the extraordinary activity and perseverance of Cobden, joined to the zeal of his supporter Bright, that brought about the final victory of free-trade principles. In 1841 Cobden was returned to Parliament by Stockport. In his very first speech in Parliament he took occasion to point out the unjust way in which the corn-laws operated, and, undeterred by the failure of his first attempts, returned again and again to this subject. After five years of unwearied contest he at last succeeded in convincing Sir Robert Peel himself, at that time prime minister, of the pernicious action of the corn-laws, and in inducing him to bring in a bill for their repeal. The bill passed both houses of Parliament before the end of June 1846, and Sir Robert Peel was the first to congratulate Cobden on his victory in a speech delivered in the House of Commons. During this long struggle Cobden had been obliged to neglect his business, which before agitation commenced had been a highly prosperous one. As a compensation for the loss he had thus sustained a national subscription was made, and a sum of about \$350,000 presented to him. After again visiting several countries on the Continent,

where he was generally received with enthusiasm, he returned to his parliamentary duties in 1847, having been returned without opposition as one of the members for the West Riding of Yorkshire. He now appeared chiefly as the advocate of parliamentary reform, economy, and retrenchment in the management of the finances of the country, and a policy of non-intervention; in all of which he found a firm and ready ally in Bright. His advocacy of a peace policy did not in every case add to his popularity. His opposition to the policy of Lord Aberdeen in 1853, which ultimately led to the Russian war, met with no success; and although in 1857 he carried a vote of censure on Lord Palmerston's Chinese policy, his action in this case was displeasing to the country generally. In 1860 he negotiated a treaty of commerce with France, and in reward for his services on this occasion was offered a baronetcy, a seat in the privy-council, and several other offices and dignities, all of which he persistently refused. A collection of his political writings appeared in 1867, and a collection of his speeches 'Speeches on Questions of Public Policy' (1870). Consult Garnier, 'R. Cobden, les Liguers et la Ligue' (1846); McGilchrist, 'Life of Richard Cobden' (1865); Morley, 'Life of Richard Cobden' (1881-3).

Cobden Club, The, an organization named after Richard Cobden, formed about a year after his death, through the influence of John Bright and others, for encouraging the diffusion of free trade and the other economical and political principles with which Cobden's name is associated. The Cobden Club has distributed a vast number of books and pamphlets.

Cobego, kō-bā'gō. See COLUGO.

Co'bern, Camden M., American Methodist clergyman: b. Uniontown, Pa., 19 April 1855. He was educated at Allegheny College, and the Theological School of Boston University and entered the ministry in 1876. He has published 'Ancient Egypt in the Light of Modern Discovery' (1892); 'Ezekiel and Daniel: a Critical Commentary' (1901).

Cob'ham, Lord. See OLDCASTLE, SIR JOHN.

Cobija, kō-bē'hā, or **Puerto La Mar**, Chile, a seaport in the territory of Antofagasta (formerly belonging to Bolivia), on the shore of the Pacific. It stands in a desert region, and is entirely dependent on the mines in the neighborhood. The roadstead is tolerably safe, but the landing-place is far from good. All the water used for drinking must be obtained by distillation, and the means of subsistence come from a considerable distance. The population is about 4,000, including those who are going to and from the mines.

Co'ble, or **Cobble**, a flat-floored boat with a square stern, furnished with a lug-sail and also propelled with oars. It has a sharp high bow, is admirably constructed for encountering a heavy swell, and is used in fishing, especially on the east coast of Great Britain. The rudder extends for some distance below the stern. There is also a small rowing-boat with the same name used by salmon-fishers and others.

Coblentz, kō'blēnts, Germany, a fortified city, anciently called *Confluentes*, from its situation at the confluence of the Rhine and Moselle. It is the capital of Rhenish Prussia, and is finely situated on the left bank of the Rhine,

COBOURG—COBURN

in the angle between that river and the Moselle, and connected by a pontoon bridge over the Rhine with Ehrenbreitstein. Pop. 46,000.

Cobourg, Kō'berg, Canada, town, port of entry and county-seat of Northumberland county, Ontario, on the Grand Trunk Railway, 69 miles northeast of Toronto and 92 miles west by south of Kingston. It has a safe and commodious harbor on Lake Ontario and enjoys a large export trade in provisions, lumber, flour, etc. It has regular steamboat connection with the important United States and other Canadian lake ports. The town is well built and has many fine residences. There are six churches, a large new collegiate institute, several schools, and a large public hall. It was formerly the seat of Victoria University now located at Toronto (q.v.). It has woolen mills, a car factory, carpet and matting factory, breweries, etc., banks and weekly newspapers, electric lights, gas and water works. Pop. (1901) 4,239.

Cobra di Capello, the Portuguese name of an East Indian serpent, the *Naja tripudians*, and sometimes applied to an African genus, the *Naja haje*, or asp, both reptiles of the most venomous nature. The former inhabits India and southeastern Asia, Java, etc. The species of the viper kind are all remarkable for the manner in which they spread out or distend the sides of the neck and head when disturbed or irritated. In the cobra di capello the conformation necessary to this action is found in the most perfect condition, as some of the ribs are loosely articulated and moved by appropriate muscles on the sides of the neck, which, when expanded, give the anterior part of the body the appearance of an overhanging arch or hood, on the middle of which, posterior to the eyes, is a greenish-yellow mark, resembling the rim of a pair of spectacles. From this mark we have the name "spectacled snake." When disturbed by the approach of an individual or otherwise, the cobra raises the anterior part of its body, so as to appear to stand erect, expands its hood, and is prepared to inflict a deadly wound. The poison fangs are attached to the anterior end of the maxillary bone, and are permanently erect, not movable, as in the rattlesnakes. So exceedingly poisonous is its bite that in numerous instances which are well authenticated death has followed within a few minutes; under ordinary circumstances a few hours is the longest term that intervenes from the infliction of the bite till the death of the sufferer, where prompt measures for his relief have not been resorted to. So numerous are these snakes in India, and so bold in frequenting human habitations, that the census returns attribute not less than 10,000 deaths annually to their bites.

To minister to the curiosity of the multitude, the jugglers of India select these venomous reptiles for their exhibitions, and having extracted their fangs keep them in cages or baskets to exhibit as dancing snakes. When the cage is opened, the juggler begins playing upon a pipe or other instrument; whereupon the cobra assumes the erect attitude, distends its hood, and remains balancing itself in this position until the music is suspended. It is most probable that this snake in common with lizards and other animals, is peculiarly affected by musical sounds. With the exception of the spectacle mark on the back of the neck and its distensible

hood, the cobra is not especially distinguished as regards coloration or form. Consult Gunther, 'Reptiles of British India'; Boulenger, 'Snakes of the British Museum'; Gadow, 'Amphibia and Reptiles.' See HAMADRYAD.

Coburg, kō'boorg, a noted family of Germany, dating from the 5th century, distinguished for intermarriages with royal houses, especially during the 19th century. A sister of Duke Ernest I. became Duchess of Kent and mother of Queen Victoria; the Duke's brother Leopold became king of the Belgians, and married in succession daughters of George IV. of England and of Louis Philippe; one of his nephews, Ferdinand, married the queen of Portugal, and was regent of that kingdom, 1853; another, August, married a daughter of Louis Philippe; one of his sons, Duke Ernest II., declined the crown of Greece, 1863, and another, Prince Albert, was the husband of his cousin, Queen Victoria of England.

Coburg, or **Koburg**, Germany, capital of the duchy of Saxe-Coburg-Gotha, situated on the left bank of the Itz, 106 miles east by north of Frankfort-on-the-Main. Among the principal buildings is the Ehrenburg Palace, one of the town residences of the Duke of Saxe-Coburg-Gotha, formerly a monastery of the Recollets, but converted into a ducal residence in 1549. It contains some interesting pictures, tapestry, etc. Some of the old doors exhibit beautiful specimens of marquetry or inlaid work. There are one or two other palaces, and various monuments, including a statue of Prince Albert, consort of Queen Victoria. The chief church is the Moritzkirche, a spacious building in the late Gothic style, with a tower 334 feet high. The government house is a handsome structure in the Italian style. The educational institutions comprise a gymnasium (founded in 1605), real school, normal school, etc. On an eminence overhanging the town is the ancient castle or fortress, now a museum, from which extensive views are obtained. In the museum are relics and writings of Luther, who resided here for three months in 1530, and here wrote some of his works. This castle was occupied by the Swedes in 1632, and was unsuccessfully besieged by Wallenstein during the Thirty Years' war. Coburg has manufactories of porcelain and ceramic wares, carriages, furniture, etc., and has also malt-works, breweries, and other establishments. Pop. (1900) 20,460.

Coburg, a thin fabric of worsted and cotton, or worsted and silk, twilled on one side, for ladies' dresses, intended as a substitute for merino.

Coburn, **Foster Dwight**, agricultural writer: b. Jefferson County, Wis., 7 May 1846. After serving in Wisconsin regiments during the Civil War he went to Kansas in 1867. He became secretary of the Kansas Board of Agriculture in 1894 and still holds that position. He is the author of 'Swine Husbandry'; and 'Alfalfa'; and also of the following books on agricultural topics prepared for and issued by the Kansas State Board of Agriculture: 'Feeding Wheat to Farm Animals'; 'Alfalfa-Growing'; 'Alfalfa, Irrigation, Well Water Supply and Subsoiling'; 'Corn and the Sorghums'; 'The Helpful Hen'; 'Cow-Culture'; 'The Beef Steer (and His Sister)'; 'The Plow, Cow and Steer'; 'Pork Production'; 'The Modern

COCA — COCAINE

Sheep'); 'The Horse Useful'; 'Forage and Fodders'; 'Dairying in Kansas'; 'Short-Horn Cattle'; 'Hereford Cattle'; 'Polled Cattle'; 'Kansas Wheat-Growing'; Railroads and Agriculture.'

Coca (*Erythroxylon coca*), a shrubby plant belonging to the natural order *Erythroxylaceae*, found wild in the mountainous regions of Peru and Bolivia, and cultivated in districts 2,000 to 5,000 feet above sea-level. The leaves are gathered and dried in the sun, and chewed with a little powdered chalk. When taken in some quantity they produce an intoxication like that of opium. As the indulgence is repeated the appetite for it increases, while that for wholesome nourishment diminishes; the miserable victim loses all power of resisting his craving, and becomes reduced to a condition of physical and mental prostration. When used in moderation coca lessens the appetite for food and enables those who have partaken of it to sustain greater fatigue than they otherwise could. It has been found the best preventive of asthmatic symptoms caused by the rapid ascent of lofty mountains. An infusion of the leaves is also used with the same effect.

Cocaine, kō'ka-ĭn, or -ĕn, a vegetable alkaloid, with the chemical formula $C_{17}H_{21}NO_4$, obtained from the leaves of the coca shrub (*Erythroxylon coca*) of South America. The leaves are digested with ether, and the solution is evaporated to dryness and extracted with boiling water. Magnesia is then added, and the solution again evaporated, after which the cocaine is removed by solution in amyl alcohol. Cocaine crystallizes in small, monoclinic prisms, which melt at 208° F., and are but slightly soluble in water, though they dissolve freely in hot alcohol and hot ether. Salts of cocaine are precipitated from solution by numerous reagents, among which are ammonia, caustic potash, sodium carbonate, picric acid, tannic acid, gold trichloride, and platinum tetrachloride. The substance popularly known as cocaine is the hydrochloride of the true alkaloid, this being the form in which the base is usually administered in medicine. Although an alkaloid first called erythroxyline, which subsequently received the name cocaine, was obtained from coca as long ago as 1855, the history of the agent in actual therapeutics does not begin until 1884 when Karl Koller demonstrated its practical utility. Since then its use has been developed to a very extensive degree, and many applications have been found for it both in medicine and surgery. Cocaine when taken internally is a cerebral stimulant, and moderate doses usually cause a pleasant sense of exhilaration and temporary increase in mental and physical power, though this is apt to be followed by a corresponding period of depression. The sense of hunger and fatigue is lessened so that privations may for the time being be better endured under the influence of the drug. Moderate doses powerfully stimulate respiration, and to a less degree, the heart and circulation. The body temperature is not affected by small amounts, but in overdose it may be elevated several degrees. The drug is to a large extent oxidised in the body though small amounts may be excreted by the kidneys. It is alleged that the quantity of nitrogenous material eliminated in the urine is decreased, indicating a reduction in tissue waste, but this has not yet been clearly

proven. In poisonous doses cocaine produces narcosis — sometimes with epileptiform convulsions — with depression, followed by paralysis, of the sensory nerves and to a less degree of the motor nerves. The symptoms of poisoning vary greatly in different individuals. Moderately toxic amounts may give rise to disagreeable mental excitement and unrest, nausea, faintness, pallor, cold perspiration and prostration, or to a sense of malaise and depression. Large doses cause rapid respiration, feeble and accelerated heart action, dilated pupils, headache, dryness of the throat, and muscular twitchings. General convulsions may supervene — or collapse occurs, the skin is cyanotic and cold, the blood pressure falls through great cardiac depression, respiration becomes slow and shallow and death occurs through failure of this function. The treatment of poisoning includes the evacuation of the stomach if the drug has been taken by mouth, and the use of stimulants such as ammonia, coffee, strychnine, ether, or alcohol. If convulsions are present these must be combated by the inhalation of small amounts of ether or chloroform and the cautious administration of sedatives. Morphine is said to be the best physiological antidote. Cocaine is used internally to some extent as a stimulant in certain febrile and mental conditions, as well as on account of its topical action in gastric disorders or in obstinate vomiting, but its most important field of utility is the production of local anesthesia in minor surgery. When applied externally in proper strength it produces a loss of sensation, particularly to pain and touch, through paralysis of the terminations of the sensory nerves. Applied to the eye it causes anesthesia, contraction of the blood vessels, reduction of intraocular tension and dilation of the pupil, but the reflex to light is not lost and there is little or no paralysis of accommodation. Brought into contact with the tongue it destroys the sense of taste for bitter substances, though salt may still be recognized and sweet and sour fluids do not entirely lose their flavor. The sense of smell may be entirely abolished by the application of cocaine to the mucous membrane of the nose, but it is not absorbed from the unbroken skin. When injected under the skin or applied to mucous membranes a feeling of numbness is produced and incisions or other painful manipulations may be practised on the part so treated without giving rise to discomfort. For this purpose solutions varying in strength from 2-10 per cent are usually employed.

The applicability of local anesthesia has been greatly extended by means of what is called nerve blocking. It has been found that on the injection of a small amount of a weak solution of cocaine into the trunk of the main nerve supplying a part sensation is cut off in that region and painless operating is possible. A plan which enables extensive areas to be anesthetized with but small amounts of the drug is called Schleich's infiltration method. For this purpose a very weak solution of cocaine, morphine, and sodium chloride is injected into the tissues until considerable local swelling or edema is caused. In this way the effect of pressure on the local nerve filaments and the local anemia combine to aid the action of the very small amounts of the alkaloids.

Owing to its more or less serious disadvantages, particularly its tendency to produce

COCCEIUS — COCCULUS INDICUS

grave poisoning in some persons even in small doses, and the difficulty of sterilizing solutions of it without impairing their virtue, numerous substitutes for cocaine have been produced by the synthetic chemists and it is not likely that a more satisfactory local anesthetic may yet be the result. Even as it is, the province of local anesthesia has been greatly extended and even laparotomies can in this way be performed without the use of a general anesthetic under conditions in which the administration of the latter would be unsafe. A very great advance was made when it was found that it was practicable to produce anesthesia embracing almost the entire body by injecting cocaine solutions into the spinal cord by means of a long hypodermic needle usually inserted between the fourth and fifth lumbar vertebræ. Anesthesia of the legs and trunk about as high as the breasts is produced within 15 minutes and lasts from two to five hours. For this purpose as for use in other ways small quantities of adrenalin are often added to the cocaine solution with the idea of neutralizing some of its undesirable qualities. Spinal anesthesia, however, is not altogether without dangers or drawbacks, and will probably never be used as a routine procedure. Cocaine is sometimes used in the treatment of the morphine habit, not infrequently with the result that the victim only exchanges one form of bondage for another no less pernicious. Many persons innocently acquire the cocaine addiction through the medium of various nostrums ostensibly intended for the cure of nasal catarrh, hay fever, etc. The temporary alleviation of his symptoms produced by the compound induces the sufferer to continue its use until he is fairly in the grip of a servitude leading to certain destruction unless its fetters are cast off by the exercise of almost superhuman fortitude. The cocaine habitué has to suffer from progressive loss of flesh and strength, digestive and circulatory disorders, trembling of the limbs, insomnia, headache, vertigo, etc. Hallucinations and even outbreaks of maniacal fury are not unusual and there is complete decadence of the mental and moral qualities. The cocaine fiend respects no convention or obligation, and will lie, steal, or use any other base means to gratify his passion for the drug, being lost to all considerations of duty or social position. In most large cities the number of these unfortunates is very great, but fortunately owing to a popular realization of the sources of danger legislative measures are being introduced into the various States which are intended to safeguard the unsuspecting from falling into the trap of the nostrum maker. According to the United States Pharmacopœia of 1900 the average dose of cocaine is said to be 30 milligrams, or one-half grain, but deaths have been recorded from amounts not much larger than this. On the other hand recovery has been observed in cases in which 20 grains and more of the drug had been taken by mouth.

Consult: H. C. Wood, "Therapeutics"; Wharton and Stille, "Medical Jurisprudence," vol. ii.

Cocceius, Heinrich von, hīn rīh fōn kōk-tsā'yoos, German jurist: b. Bremen 1644; d. 1719. He studied at Leyden, and Oxford; was in 1672 professor of law at Heidelberg, and in 1688 at Utrecht; in 1690 regular professor of

laws at Frankfort-on-the-Oder. He went to The Hague in 1702, without giving up his office, on occasion of the disputes as to the hereditary succession of the house of Orange; and received for his services, in 1713, the rank of baron of the empire. As a lawyer he was the oracle of many courts, and his system of German public law ('Juris Publici Prudentia') was almost a universal academical text-book of this science.

Cocco, Cocoa-root, Eddoes, Taro, various plants of the genera *Caladium* and *Colocasia* of the natural order *Araceæ*. They are widely cultivated for food in the tropical and subtropical islands of the Pacific, the West Indies, and adjoining continental regions, and to a less extent in other warm countries. The edible part most desired is the starchy acrid tuber which is eaten like potatoes or made into *poi*, a substance obtained by roasting the tubers, pounding them with water to a paste and allowing the mass to ferment before being eaten either in that form or again prepared for the table. In this form the roots are a staple food of the Hawaiians. During the process of roasting or boiling the tubers lose their acidity, which quality is, in some varieties, almost wanting. The young leaves of some species are used as pot-herbs. The principal species is *Colocasia antiquorum* var. *esculentum*, a perennial herb with heart-shaped peltate green leaves often three feet long and nearly as wide; and an inconspicuous spadix. It is very popular as a bedding plant in the United States, since it gives a subtropical effect, especially when grouped with cannas and crotons. Popularly it is known as elephant's ear. It is easily grown, being started in the greenhouse, transplanted to the open ground after danger of frost, freely supplied with water, and at the approach of frost in the autumn, stored in a cool, dry cellar.

Coc'colith, the name given in 1858, by Huxley, to one of certain minute oval or globular calcareous bodies found in countless numbers in the ooze of the Atlantic, either detached or adherent to small pieces of protoplasm. They have since been dredged up from other places, and found in chalk, and, according to Guembel, in limestone of all ages. Carter thinks they belong to *Melobesia*, a genus of algæ.

Coccosteus, kōk-kōs'tē-ūs, a genus of fossil placogonoid fishes, pertaining chiefly to the Devonian and Old Red Sandstone systems, but met with also in Silurian strata. The head was protected by a great shield covered with tubercles. Besides this bony cuirass there was also a ventral shield, but the rest of the body was naked. The mouth was furnished with small teeth.

Coc'culus In'dicus, or fish-berry, as it is commonly known in the United States, is the seed of a herbaceous climbing vine (*Anamirta paniculata*), a species of *Menispermaceæ*. The dried berries are imported from the East Indies. The drupe resembles a round berry, the size of a pea or larger, wrinkled externally, and with a brittle husk. The kernel is intensely bitter. It contains about one fiftieth of its weight of a powerful bitter narcotic poison called picrotoxin, also bases called menispermene, a crystalline base, paramenispermene, and several organic acids. Picrotoxin is used as an adulterant in enriching

COCCUS

and imparting a bitter taste to malt beverages, and is thrown into rivers in which fish abound to stupefy them, so that they may be readily caught. It has been used in the form of an ointment in certain skin diseases, and in decoctions for killing vermin in the hair of children and animals, although death is sometimes caused through this latter use. The symptoms of poisoning are twitching and incoördination of the muscles, increased reflex excitability, convulsions, coma, and death from asphyxia.

Coccus, in zoology, a genus of insects of the order *Hemiptera*, family *Coccidæ*. Generic character: antennæ filiform, of 10 articulations in the male, nine in the female, shorter than the body; rostrum pectorale, conspicuous only in the females; males with two large incumbent wings; females apterous, subtomentose, fixed, and becoming gall-shaped or shield-shaped after impregnation. These little insects are remarkable for many peculiarities in their habits and conformation. The males are elongated in their form, have long, large wings, and are destitute of any obvious means of suction; the females, on the contrary, are of a rounded or oval form, have no wings, but possess a beak or sucker formed of the extremely modified appendages of the mouth, by which they fix themselves to the plants on which they live, and through which they draw their nourishment. At a certain period of their life the females attach themselves to the plant or tree which they inhabit, and remain thereon immovable during the rest of their existence. In this situation they are impregnated by the male; after which their body increases considerably, in many species losing its original form and assuming that of a gall (whence Réaumur's name, *Gallinsecta*, for the family), and, after depositing the eggs, drying up and forming a habitation for the young. This change of form is not, however, constant to all the species, which has given rise to a division of the genus into two sections: those which assume a gall shape, in which the rings of the abdomen are totally obliterated, are called "kermes" by some authors; and those which retain the distinct sections of the abdomen, notwithstanding the great enlargement of the body, are called "true cocci," or "cochineal" (q.v.). They are impregnated in the spring, after having passed the winter fixed to plants, particularly in the bifurcations and under the small branches. Toward the commencement of summer they have acquired their greatest size, and resemble a little convex mass without the least appearance of head, feet, or other organs. Many species are covered with a sort of cottony down. Each female produces thousands of eggs, which are expelled by a small aperture at the extremity of the body. As soon as they are produced they pass immediately under the parent insect, which becomes their covering and guard; by degrees her body dries up, and the two membranes flatten and form a sort of shell, under which the eggs, and subsequently the young ones, are found. Soon after the death of the mother the young insects leave their hiding-place and seek their nourishment on the leaves, the juices of which they suck through the inflected rostrum placed beneath their breast.

But it is with a view to their importance as an article of commerce, arising from their use

in the arts, that the insects of this genus are particularly interesting. When it is considered that the most brilliant dyes and the most beautiful pigments, as well as the basis of the most useful kinds of cement, are their product, it will be acknowledged that to none of the insect tribe, except, perhaps, to the bee and the gall-insect, are we more indebted than to these singular and apparently insignificant little beings. Kermes, the scarlet grain of Poland, cochineal, lac-lake, lac-dye, and all the modifications of gum-lac, are either the perfect insects dried, or the secretions which they form. The first-mentioned substance is the *Coccus ilicis*. It is found in great abundance upon a species of evergreen oak (*Quercus coccifera*), which grows in many parts of Europe, and has been the basis of a crimson dye from the earliest ages of the arts. It was known to the Phœnicians before the time of Moses; the Greeks used it under the name of *kokkos*, and the Arabians under that of *kermes*. From the Greek and Arabian terms, and from the Latin name *vermiculatum*, given to it when it was known to be the product of a worm, have been derived the Latin *coccineus*, the French *cramoisi* and *vermeil*, and the English "crimson" and "vermilion." The early Jews, the Greeks, the Romans, and until lately the tapestry-makers of Europe, have used it as the most brilliant red dye known. The scarlet grain of Poland (*Coccus polonicus*) is found on the roots of the *Scleranthus perennis*, which grows in large quantities in the northeast of Europe and in some parts of England. This, as well as several other species, which afford a similar red dye, have, however, fallen into disuse since the introduction of cochineal. The introduction of aniline dyes has greatly injured the cochineal industry.

Lac is a secretion from a species of *Coccus* inhabiting India, where it is found in astonishing abundance on the *Ficus religiosa*. In its native state, not yet separated from the twig on which it has been deposited, it is called "stick-lac"; when separated, powdered, and the coloring matter washed from it, it is denominated "seed-lac"; "lump-lac" when melted into cakes; and "shell-lac" when purified and formed into thin laminæ. Lac-lake is the coloring matter of stick-lac precipitated from an alkaline lixivium by means of alum.

Coccus is also the name of a family of bacteria characterized by their spherical form and consisting of a number of genera, all named for certain growth characters. Thus cocci that grow in chains are termed *Streptococci* in which group the virulent bacteria that cause blood-poisoning, septicæmia, and the organism of erysipelas are found; Cocci that grow in pairs are termed *diplococci*. The *diplococcus* of pneumonia, and the *diplococcus* of gonorrhœa are in this group. Others grow in bunches,—*Staphylococci*. The common organism of pus is *Staphylococcus pyogenes aureus*, by bacteriologists usually called *S.p.a.* Other spherical forms are known as *Micrococci*, one of which group, the *Micrococcus urea*, is found in the urine as causative agent in excessive urinary fermentation. Some forms of this family group grow in packets. These are termed *Sarcinæ*. They are very abundant in the air, and are frequently associated with chronic gastric fermentations. A large number of different forms of this family are known, the greater majority of which are

COCCYGODYNIA — COCHIN-CHINA

not pathogenic but very useful in agriculture and the arts, particularly in agricultural processes. As many as a hundred different species have been found in the air, and Chester has described 36 species of *Streptococcus*, 91 species of *Micrococcus* (*Staphylococcus* here included), 14 species of *Sarcinæ*, 3 species of *Planococci*, or movable cocci, and 3 species of *Planosarcinæ*. See BACTERIA.

Consult: Chester, 'Manual of Determinative Bacteriology.'

Coccygodynia, kŏk''sĭ-gŏ-dĭn'ĭ-a, a painful affection usually situated at the end of the spinal column, in and about the region of the coccyx. It is probably many affections rather than one, as neuralgias, arthralgias, and sympathetic pains may be felt in this region. It is an affection more common in women than in men, being more prevalent in those women who have had children. Pain is felt, usually of a decided sharp character, and definitely localized and in the region, on rising after sitting down, walking up and down stairs, and on defecation. The diagnosis may be extremely difficult and the treatment purely medical or surgical.

Coccygomorphæ, an order or suborder of birds, proposed by Huxley, and nearly equivalent to the *Cuculiformes* of some authors. All have the palate desmognathous or provided with a more or less well developed band of bone binding the two maxillary bones together across the palate; but, owing to the great diversity of characters exhibited by the families, a brief definition is impossible. The following families are included by Stejneger, and indicate the limits of the group: *Cuculidæ*, cuckoos (q.v.); *Coraaciidæ*, rollers, of Madagascar; *Alcedinidæ*, kingfishers (q.v.); *Upupidæ*, hoopoes (q.v.), of the Old World; *Musophagidæ*, plantain eaters (q.v.) of Africa; *Todidæ*, todies (q.v.), of Mexico and the West Indies; *Momotidæ*, sawbills (q.v.); *Bucerotidæ*, hornbills (q.v.), of the Old World; *Rhamphastidæ*, toucans (q.v.), of tropical and sub-tropical America; *Caprimulgidæ* (q.v.), goatsuckers, cosmopolitan; *Bucconidæ*, barbets and puffbirds (qq.v.); and *Indicatoridæ*, guide-birds (q.v.), of Africa.

Coccyx, kŏk'sĭks. See OSTEOLOGY.

Cochabamba, kŏ-chä-bäm'ba, Bolivia, a central department of the republic, bounded on the north by the department of Beni, on the east by Santa Cruz, on the south by Chuquisaca and Potosi, and on the west by Oruro and La Paz. Its area is about 22,000 square miles. The following list shows its provinces and the varieties of climate: Tarata, Mizque, Punata, and Ayopaya are tropical; Chaparé, Tapacari, Totorá, Arque, and Furacares are semi-tropical; the capital district is temperate. The gold-mines at Choquecamata in Ayopaya have been worked for a long time, and were famous during the period of Spanish supremacy. Silver and marble are found at Palca; gold and silver at Sayari; silver in Mizque, Colcha de Arque, and Quioma. Cochabamba has been called "the granary of Bolivia." It is the great wheat and maize growing section of the country, and is also noted for its fine horses bred from imported Peruvian and Chilean stock. All classes of agricultural products can be grown on the extensive and rich plains of Sacaba, province of Chaparé, where useful medicinal plants are also found, and alfalfa grows luxuriantly. In

the province of Ayopaya there are great tracts of pasture land, and wool, barley, etc., are produced. In Tapacari all the European fruits and cereals thrive, and herds of llamas, cattle, and horses abound. All cereals thrive in Mizque, a province which also contains extensive vineyards, and produces the excellent and nutritive Cochabamba corn. The agricultural products are manufactured on a limited scale. According to the census taken by the national committee and approved by President Pando, 5 Dec. 1902, the department has 328,163 inhabitants.

Cochabamba, Bolivia, the capital of the department of the same name. It is one of the principal centres of trade in the republic, and its elevation (8,400 feet above the level of the sea) gives it a cool and healthful climate. The city has manufactures of leather goods, woolen cloths, and other products. Pop. over 40,000.

Cochin, Charles Nicolas, French engraver: b. Paris 1688; d. 1754. He practised painting till his 23d year, and this was of considerable advantage to him in the art of engraving, to which he afterward devoted himself. In 1731 he became a member of the Academy of Painting.

Cochin, Charles Nicolas, French engraver: b. Paris 22 Feb. 1715; d. Versailles 29 April 1790. He was a son of the preceding, and his productions are superior to those of his father. The collection of his works contains more than 1,500 pieces, among which there are 112 likenesses, in the form of medals, of the most renowned French scholars and artists of his time, who were almost all his friends. Besides his essays in the memoirs of the Academy, he published 'Voyage d' Italie' (1758), and several other works. His frontispieces and vignettes are remarkable for neatness and taste. His views of 16 French seaports are of great value. His composition in general is rich, delicate, and pleasing. He was a member of the Academy, and occupied several places of importance.

Cochin, kŏ'chĭn, India, a seaport of Hindustan, in the Malabar district of the Madras presidency, situated on a small island. It is a picturesque place with many quaint old Dutch buildings. Its harbor, though sometimes inaccessible during the southwestern monsoon, is the best on this coast. Cochin was one of the first places in India visited by Europeans. In 1502 Vasco da Gama established a factory and soon after Albuquerque built a fort; he also died here in 1524. In 1663 the Dutch took the place, in 1795 the British. Pop. about 18,000.

Coch'in, a variety of the domestic fowl, imported from Cochin-China. It is a large, ungainly bird, valuable chiefly owing to its fecundity, eggs being laid even during the winter.

Cochin-China, a country forming part of the peninsula of southeastern Asia, and generally regarded as comprising the whole of Anam and Lower or French Cochin-China. Three of the six provinces into which the latter was divided were acquired at one period, and the remaining three at another period. A persecution of the French Roman Catholic missionaries in Anam furnished the French with an occasion of regaining a footing in the East. An expedition against Cochin-China was decided on in 1857, and Saïgon was occupied. The Austro-

COCHIN-CHINA — COCHINEAL

Italian war deferred further operations till 1861, when the conquest of Metho gave the French possession of the most fertile district of Lower Cochin-China. The war continued till 5 June 1862, when a peace was concluded at Saïgon with the king of Anam, which was ratified at Hué 15 April 1863. By this treaty the king agreed to cede to the French the three provinces of Bienhoa, Saïgon, and Metho, along with the island of Poulo Condore, to permit the Roman Catholic religion in his kingdom, to open three of the ports in Tonquin to French ships, and to pay an indemnity of 24,000,000 francs (about \$4,800,000). Although the inhabitants were found to be on the whole sufficiently tractable, yet a few revolts took place, whereupon Admiral De la Grandière, on the pretext that all these disturbances had their origin in the provinces of Lower Cochin-China which had remained to Anam, namely, Vinhlong, Chaudoc, and Hatien, took possession of these provinces, and declared them French territory, 25 June 1867. The territory thus acquired by France in this peninsula covers 21,710 square miles, and in 1894 had a population of 2,226,935. It is now organized in departments, prefectures, sub-prefectures, and cantons. In 1882-3 France asserted a claim to the protection of Tonquin, and indeed the entire Anam territory, and after some fighting this claim was conceded by the king. Tonquin was accordingly taken possession of by France in 1884, and is now under French administration, native resistance having now entirely ceased. Anam (q.v.) forms a protectorate.

The northern and eastern parts of French Cochin-China are hilly, but the rest of the territory consists almost entirely of well-watered low alluvial land. The lowlands, where the waters stagnate, are covered with a rank vegetation from three to ten feet high; contiguous to the flowing streams are extensive rice-grounds. Where the soil is somewhat raised above the water-level it is very fertile, and in some places ranges of low hills follow the line of the rivers. In the more elevated districts are grown tobacco, sugar-cane, maize, indigo, and betel. Among the other products are tea, gums, coconut oil, silk, spices, and various farinaceous and aromatic articles. The Anamites raise also great numbers of buffaloes, cattle, hogs, and birds; the first being employed in agriculture, and, as well as oxen, for draft purposes; but since the French conquest oxen are reserved more strictly for food. Industrial arts are as yet limited among the natives. They are skilful in all kinds of basket-work, in which they use the reeds and other similar materials which abound in the low lands; silk and cotton are also wrought. But they excel in the use of wood, of which their temples, pagodas, and tombs are built, and ornamented with elaborate carving. They live in villages—numbering nearly 1,000—adjacent to the rivers, which, in the unsuitableness of the country for land traffic, form almost the only means of communication. Their houses are either tiled or thatched with straw, the roofs being supported with wooden pillars; the better class are in two sections, the inner apartments and the outer veranda, which serves for use in the daytime; they are often well furnished, and not devoid of comfort. The only roads at present are those connecting Saïgon, the capital, with the principal towns. Telegraphic communication between many of the

principal places has been opened, and is being extended. The principal export is rice, of which there is annually exported about 7,000,000 hundredweight, mainly to China; cotton and silk are also exported.

Cochin-China, Upper, or Dong-trong, a narrow strip of land, consisting of four provinces, on the east coast of Anam, to which empire it belongs, extending from Tonquin on the north to Champa on the south. The most important river is that on which the chief town P'hu-thua-thien or Hué stands. In the most fruitful parts of this region aloes wood (of the *Aquilaria ovata*), corn, sugar-cane, and cinnamon flourish. From October to January the weather is often very stormy, and typhoons rage frequently. The climate is healthy and pleasant. Camphor is produced in the district in the utmost perfection.

Cochineal, an insect (*Coccus cacti*), used as a dye. It is a native of Mexico, but has been introduced into Europe and Algiers. Even the live insects were imported, and plantations of cactus were cultivated for their nourishment. The French and Spanish kermes, which at one time was in high repute, disappeared and was soon entirely forgotten. It is a small insect with the body wrinkled transversely; its abdomen of a deep mulberry color, and bristly in the posterior part; the legs are short and black, the antennæ subulate and about one third the length of the body. The male has two erect wings, the female none. The principal district in which they are reared is in the province of Oaxaca, those of the district of Mestique being considered the best insects. There are plantations of the nopal (*Opuntia coccinellifera*), upon which they feed, the insects being tended with care equal to that ordinarily bestowed upon silkworms. Before the rainy season sets in, branches of the nopal covered with insects are cut off and brought under shelter to protect them from the weather. At the close of the wet season, about the middle of October, the plantations are stocked from these supplies by suspending little nests made of some soft woody fibre, each containing 8 or 10 females, upon the spines of the nopal. The insects, warmed by the sun, soon emerge and lay their eggs, each female producing more than 1,000 young. These spread rapidly over the plants, and as the young females become impregnated they attach themselves to the leaves and swell to great size, presenting the appearance more of vegetable excrescences than of animated creatures. In this condition they are gathered for the cochineal. The males, which are few in number, not more than one to 100 or 200 females, are of no value for this purpose. The females are picked off with a blunt knife, the first crop about the middle of December, and subsequently several more of as many successive generations, the last being in May. A laborer can pick off only about enough to make two ounces of cochineal in a day. Those taken off full of young lose about two thirds of their weight in the process of drying, to which they are subjected as soon as they are killed, which is done either by dipping them in a basket into boiling water, or placing them in a hot oven, or on plates of hot iron. By the first method, usually considered the best, the insects turn to a brownish red color, losing a portion of the white powder with which they

COCHINEAL-FIG — COCK

were previously loaded between the wrinkles of the body. In the oven they retain this, and their color is then gray. Those killed on hot iron turn black. Such is the origin of the different varieties known in our market as "silver grains and black grains," and the "foxy" of the London market, the last being those killed by boiling water, though others ascribe it to the former being the female before laying her eggs, and the latter after she has parted from them. The quality of the cochineal is the same in both cases. When dried, the cochineal presents the form of grains, convex on one side and concave on the other, about one eighth of an inch in diameter, with the transverse wrinkles still visible. It is stated that it takes about 70,000 insects to weigh a pound.

Cochineal-fig, a name given to *Opuntia coccinellifera* and two other species of cacti, natives of Mexico and the West Indies, the plants on which the cochineal insect lives. See CACTUS; COCHINEAL.

Cochituate (kō-chīt'ū-āt) **Lake**, Mass., a narrow body of water, about four miles long, in Middlesex County, 17 miles west of Boston. From this lake for many years Boston has derived its principal water-supply.

Cochlea, kōk-lē'ā, an important part of the internal ear, so called from its shape, which resembles that of a snail-shell. See EAR.

Cochlearia, kōk-le-ā'rī-ā, a genus of annual maritime herbs of the mustard family (*Crucifera*). It numbers upward of 25 species, all natives of the colder parts of the north temperate zone, and not familiar generally. About four species are found on the Arctic and northern Pacific coasts of North America. Two very distinct species quite well known are the horse-radish (*C. armoracia*), escaped from cultivation, and now found wild in the moist ground along streams, and scurvy-grass (*C. officinalis*), considered of great value as an antiscorbutic. If eaten fresh, it is a stimulant and diuretic, but is feeble if allowed to dry before being taken.

Cochran, John, American soldier and lawyer: b. Palatine, Montgomery County, N. Y., 27 Aug. 1813; d. New York 7 Feb. 1898. He was graduated at Hamilton College 1831, practised law in Oswego from 1834 to 1845, when he removed to New York, where his talents as lawyer and orator at once brought him into prominence. He was surveyor of the port of New York 1853-7, and a Democratic member of Congress 1857-61, serving as chairman of the Committee on Commerce. During the Civil War he commanded the 1st United States Chasseurs in the Peninsula campaign; was commissioned a brigadier-general 17 July 1862, and commanded a brigade in Gen. Couch's division of the Army of the Potomac; was with the reserve at the battle of Antietam and took an active part in the pursuit of the enemy. He was attorney-general of New York State 1863-5. He was active in securing Greeley's nomination for President in 1872; was president of the New York Common Council 1872, and acting mayor when Mayor Hall retired during the Tweed ring disclosures; again a member of the council in 1883, and a police justice 1889.

Cochrane, Thomas, 10th Earl of Dundonald, British naval officer: b. Annsfield, Scotland,

14 Dec. 1775; d. Kensington, England, 31 Oct. 1860. He entered Parliament in 1806. In 1814 he was accused of conspiring to circulate a false report of Napoleon's death for speculative ends, and though he protested his innocence he was imprisoned for a year, fined, and was expelled from the navy and the House of Commons. In 1818 he accepted an invitation to organize the navy of Chile and performed many brave exploits during the contest with Spain. He left the service of the Chileans and was commander of the Brazilian navy from 1823 to 1825, when he resigned, because accused of insubordination. In 1827 and 1828 he commanded the Greek army. In 1832 he was cleared of the charges brought against him in 1814, and restored to the Order of the Bath and to the English navy. He was appointed vice-admiral in 1841; admiral in 1851, and rear-admiral of the United Kingdom in 1854.

Cock, the male of the domestic fowl. At what time this valuable species of pheasant was brought under the immediate control of man it is now impossible to determine; but, as the forests of many parts of India still abound with several varieties of the cock in the wild or natural condition, it is reasonable to conclude that the race was first domesticated in Eastern countries, and gradually extended thence to the rest of the world. It is stated that the cock was first introduced into Europe from Persia; and Aristophanes speaks of it as "the Persian bird." Nevertheless it has been so long established throughout western regions as to render it impossible to trace its progress from its native wilds.

The cock has his head surmounted by a notched, crimson, fleshy substance called "comb": two pendulous fleshy bodies of the same color, termed "wattles," hang under his throat. The hen has also a similar, but not so large nor so vividly colored excrescence on her head. The cock is provided with a sharp horn or spur on the outside of his tarsus, with which he inflicts severe wounds; the hen, instead of a spur, has a mere knot or tubercle. There is, in both sexes, below the ear, an oblong spot, the anterior edge of which is reddish, and the remainder white. The feathers arise in pairs from each sheath, touching by their points within the skin, but diverging in their course outward. On the neck they are long, narrow, and floating; on the rump they are of the same form, but drooping laterally over the extremity of the wings, which are quite short, and terminate at the origin of the tail, the plumes of which are vertical. In the centre of the cock's tail are two long feathers, which fall backward in a graceful arch and add great beauty to the whole aspect of the fowl. The plumage is infinitely varied in both colors and markings, being in some breeds of the greatest richness and elegance, and in others of the simplest and plainest hue. Except in the pure white breeds, the plumage of the cock is always more splendid than that of the hen. The cock, when in good health and full plumage is apparently conscious of his personal beauty and courage. The cock is strongly attached to what may be called his harem, and is often seen strutting at the head of 10 or 15 hens. His sexual powers are matured when he is about six months old, and his full vigor lasts for about three years, varying

COCK-FIGHTING — COCKBURN

in earliness of maturity and duration with his size and the climate. See also HEN.

Cock-fighting, an ancient sport of unknown origin, but practised among both the Greeks and the Romans. An annual cock-fight was instituted at Athens, and Æschines reproaches Timarchus, and Plato the Athenians in general, with their fondness for the cock-pit. The breeds of Rhodes and of Tanagra in Bœotia were in great esteem in Greece. The Romans seem to have used quails and partridges also for this purpose. This sport has long been a favorite with both Americans and English, although repeatedly denounced and prohibited by the laws. The size proper for game-cocks may be said to be not less than four pounds eight ounces, nor above four pounds ten ounces. The strain from which the cock is chosen ought to be distinguished for victory. For the combat they are armed with steel or silver spurs, or "gaffles." The place appropriated to fighting is called a "pit," and consists generally of a mound of earth covered with sod, and surrounded by seats in circular tiers. The battle is conducted by two "setters-to," who place the cocks beak to beak. When they are once "pitted" (this verb owes its origin to the sport of cock-fighting), neither of the setters-to can touch his cock so long as they continue to fight, unless their weapons get entangled. In the Philippine Islands cock-fighting is pushed almost to the verge of a craze. Nearly every village has its pit, and every peasant his cock. The peasant, too, is said to rescue his fighting-cock rather than his wife or child in the event of fire, and wherever he goes he takes it with him. The sport is there practised in a very cruel form, and many are ruined by excessive betting. Throughout all Spanish-America cock-fighting is more or less in favor. It was formerly a regular sport in the public schools of England, and schoolmasters received dues in connection with it. Cock-fighting is still prevalent in China, Persia, and Malacca.

Cock-Lane Ghost, a famous hoax by which many people of London were deceived in 1762, arising from certain knockings heard in the house of a Mr. Parsons, in Cock Lane. Dr. Johnson was among those who believed in the supernatural character of the manifestations; but it was found out that the knockings were produced by a girl employed by Parsons.

Cock of the Plains. See CAPERCAILZIE.

Cock of the Rock (*Rupicola crocea*), a South American bird of a rich orange color, with a beautiful crest, belonging to the family *Cotingidæ*. The name, or its French equivalent, is also applied to several related species.

Cock of the Woods. See CAPERCAILZIE.

Cockade (Fr. *cocarde*), a plume of cock's feathers, with which the Croats in the service of the French in the 17th century adorned their caps. A bow of colored ribbons was adopted for the cockade in France, which soon became a national emblem and party signal. During the French Revolution the tricolored cockade — red, white, and blue — became the national distinction. National cockades are now to be found over all Europe. In Germany cockades of black, red, and gold, after being forbidden in 1832, were again allowed in 1848, and even introduced into the army. Since 1850, however, they

have again ceased to be publicly worn. In Italy the former emblem of the party of progress, the green, red, and white cockade, was recognized by the government of Piedmont in 1848, and since the formation of the kingdom of Italy it has formed the national cockade.

Cockaigne, kōk-ān', **Land of**, an imaginary land of idleness and plenty, in which the houses were roofed with cake, the rivers ran wine, and roasted fowl offered themselves to be eaten. The term was applied in derision to both London and Paris. The corresponding term in English is "lubberland," and in German "*Schlauraffenland*." 'The Land of Cockaigne' was the title of a satirical poem written not later than 1300.

Cockatoo, an English rendering of a Malayan name for certain species of birds of the parrot family (*Psittacidæ*). They are comprised in *Cacatua*, and five other genera forming a sub-family, which, besides having some peculiarities of internal anatomy, is distinguished from true parrots by the greater height of the bill, and its being curved from the base, and by the lengthened, broad, and rounded tail. The head is also large, and in the true cockatoos is surmounted by a crest of long and pointed pink or yellow feathers, with their tips directed forward, which can be erected and expanded like a fan, or depressed, at the pleasure of the bird. The true cockatoos are also all of generally whitish plumage, but often finely tinged with red, orange, and other colors, or mixed with these colors in more brilliant displays. The cockatoos are confined to the Australian region and the neighboring Malayan islands, with the exception of a single Philippine species. The sulphur-crested cockatoos (*Cacatua sulphurea* and *galerita*) are well-known cage-birds which may be taught a few words, but their vocal efforts are chiefly limited to the harsh cry "cockatoo."

Cock'atrice, a fabulous serpent or serpent-like monster anciently believed to be hatched from a cock's-egg. It is often simply another name for the basilisk (q.v.).

Cockburn, kō'bērn, **SIR Alexander James Edmund**, English jurist: b. 24 Dec. 1802; d. 20 Nov. 1880. He studied at Cambridge; was called to the bar in 1829, and soon became distinguished as a pleader before parliamentary committees. In 1847 he became member of Parliament for Southampton in the Liberal interest; became solicitor-general and was knighted in 1850. He was made chief justice of the common pleas in 1856; and lord chief justice in 1859. Among the many famous trials over which he presided were the Wainwright case and Tichborne case. He represented Great Britain at the Geneva arbitration tribunal for the adjustment of the "Alabama Claims," 1871-2.

Cockburn, **Alicia** or **Alison Rutherford**, Scottish lyrist: b. Fairnilee, Selkirkshire, 8 Oct. 1713; d. Edinburgh 22 Nov. 1794. In 1731 she married Patrick Cockburn, advocate, and in 1753 was left a widow. She died having for 60 years and more been a queen of Edinburgh society. In person she was not unlike Queen Elizabeth. Of her lyrics the best known is the exquisite version of 'The Flowers of the Forest' ("I've seen the smiling of Fortune beguiling"), commemorating a wave of calamity that swept over Ettrick Forest, and first printed in 1765. Mrs.

COCKATOOS (Cacatuinæ).



1. The Slender-billed Cockatoo (*Licmetis nasicus*).

2. The Black or Crow Cockatoo (*Calyptorhynchus galeatus*).

COCKBURN—COCKLE

Cockburn in 1777 discerned in Walter Scott "the most extraordinary genius of a boy"; in 1786 she made Burns' acquaintance.

Cockburn, Sir George, English naval officer: b. London 22 April 1772; d. Leamington 19 Aug. 1853. He entered the navy in early youth, and about 1812 obtained the rank of rear-admiral. He took part in the capture of Washington City in 1814 and conveyed Napoleon to Saint Helena in 1815. He was a lord of the admiralty from 1818 to 1828, and sat in Parliament for many years.

Cockburn, George Ralph Richardson, Canadian educator: b. Edinburgh, Scotland, 15 Feb. 1834. He graduated at Edinburgh University, 1857, and studied in France and Germany. He went to Canada in 1858, became rector of the Upper Canada Grammar School; was commissioned to inspect the higher educational institutions of the province, and study the subject in all its phases. The investigation lasted two years, and he presented its results in two able reports. In 1861 he was made principal of Upper Canada College, and a member of Toronto University senate. Under his administration of 20 years the college attained a high reputation for the excellence of its teaching and discipline.

Cockburn, Henry Thomas, Lord, Scottish judge: b. Edinburgh, Scotland, 26 Oct. 1779; d. Bonaly, near Edinburgh, 26 April 1854. It was chiefly in connection with political cases that he rose to eminence in his profession, one leading transaction being his gratuitous defense of several persons tried for treason in the year 1818. He became solicitor-general for Scotland in 1830, and in 1834 one of the lords of session. 'Memorials of His Time' (1856) is an invaluable record of the social history of Scotland, narrated in the raciest and most genial manner. Not less interesting is his life of his friend Lord Jeffrey (1852).

Cockburn, Sir John Alexander, Australian statesman: b. Crosbie, near Duns, Scotland, 23 Aug. 1850. He was educated at Kings' College, London, and settled in South Australia in 1875, was mayor of Jamestown 1877-81; sat in the House of Assembly for Burra 1884-7, and for Mount Barker 1887-98. He was minister of education 1885-7; premier and chief secretary 1889-90; chief secretary 1892; minister of education and agriculture 1893-8; agent-general for South Australia 1898-1901. He represented South Australia at the International Commercial Congress in Philadelphia in 1899, and other important conferences. He was knighted in 1900.

Cockchafer. See CHAFER.

Cock'er, Edward, English engraver and teacher of writing and arithmetic: b. 1631; d. 1675. He is said to have published 23 books of exercises in penmanship, one of which is preserved in the British Museum. The great work with which his name is so intimately associated that the phrase, "according to Cocker," has become proverbial, was first published in 1678 under the title of 'Cocker's Arithmetic, Being a Plain and Familiar Method, Suitable to the Meanest Capacity, for the full Understanding of that Incomparable Art, as It is now Taught by the Ablest Schoolmasters in City and Country, Composed by Edward Cocker, late Practitioner in the Arts of Writing, Arithmetic,

and Engraving.' The book reached a 37th edition by 1720, and upon it most of the succeeding treatises on arithmetic were based. Two other works bear Cocker's name—a treatise on 'Decimal Arithmetic' and an 'English Dictionary,' but it has been surmised that they are not of his authorship, but of that of his publisher, Hawkins.

Cocker, a variety of spaniel (q.v.).

Cockerell, kök'ër ël, Charles Robert, English architect: b. London 28 April 1788; d. London 17 Sept. 1863. He wrote monographs on the mausoleum of Halicarnassus and other archæological subjects. Advancing to the front rank of his profession, he became an associate of the Royal Academy in 1829, a member in 1836, and professor of architecture in 1839, delivering lectures which were highly esteemed and largely attended. He was happier in following classic models than in the Gothic style. He built the Bank of England and many other public and private buildings. He wrote on the 'Iconography of Wells Cathedral'; 'Sculptures of Lincoln and Exeter Cathedrals'; 'Tribute to the Memory of Sir Christopher Wren'; etc.

Cock'ermouth, England, a town in the county of Cumberland. It is situated at the confluence of the Cocker with the Derwent, 24 miles southwest of Carlisle, and 260 miles northwest of London. The old castle, supposed to have been built soon after the Conquest, stands on a bold eminence. Mary Queen of Scots was imprisoned in it in 1568, and in 1648 it was dismantled by the parliamentary forces. Cocker-mouth is the birthplace of the poet Wordsworth, in memory of whom a fine stained-glass window has been inserted in the church of All Saints. Pop. (1901) 5,355.

Cockle (*Cardium*), a genus of bivalve shellfish forming the type of the family *Cardiidae*. The general characteristics are—shells nearly equilateral and equivalvular; hinge with two teeth, one on each side near the beak, and two larger remote lateral teeth, one on each side; prominent ribs running from the hinge to the edge of the valve. The animal has a powerful foot, with which it burrows in the sand. For this purpose it first distends it with water, to give firmness to it. This foot may also be used to enable the animal to move from place to place, for by first bending it and then suddenly straightening it the animal may project itself to a considerable distance. The common cockle (*Cardium edule*) is common all round the coasts of the British islands wherever it finds suitable sand-beds to live in, and is also found in the Baltic, and elsewhere. It is much used as an article of food. A prickly species, the *Cardium aculeatum*, found on the coast of Devon, is also eaten. Among American species, which, however, are not eaten, are *C. islandicum*, found to the north of Cape Cod, and *C. pinnulatum*, found about Long Island Sound. On the coast of Labrador *Serripes groenlandicus* reaches a large size, being nearly four inches long, and two inches thick. This genus is represented by fossils from the Devonian Period onward, but it attains its maximum in recent seas.

Cockle, kök'l. See CORN-COCKLE.

Cockle, Order of the, that of St. Michael, the knights of which wore the scallop as their badge. This order was instituted by Louis XI.

COCKLEBUR—COCKSCOMB

of France, who began to reign 1461 A.D. The dress is thus described from a MS. inventory of the robes at Windsor Castle in the reign of Henry VIII.: "A mantell of cloth of silver, lyned withe white satten, with scallope shelles. Item, a hoode of crymsin velvet, embraudeard with scallope shelles, lyned with crymsin satten."

Cock'lebur, a coarse annual plant, a species of *Xanthium*, belonging to the rag-weed family (*Ambrosiaceæ*). There are five or more species widely distributed throughout the temperate regions. Three of these species occur very commonly in waste grounds in nearly every part of the United States, excepting the interior region east of the Mississippi River, where the plant is rare. A distinct native of this country is the American cocklebur (*X. canadense*), while two other species (*X. strumarium* and *X. spinosum*), had their advent from Europe or Asia. Wool-growers are seriously troubled by the hook-spined burs of this plant, which catch in the sheep's wool, depreciating its value. In South Africa the injury to the wool industry is so great that strict laws are enforced to keep the plant from multiplying.

Cock'ney, a nickname for a native of London, especially for a person both born and bred there, the term being often used with a certain sense of disparagement, and as implying ignorance of other than city affairs, or as suggesting effeminacy. As to the origin of the word there has been much dispute, and many explanations, some of them sufficiently absurd, have been propounded. In the 14th and 15th centuries it was used to mean a petted or cockered child; and, according to the most recent etymology, its original meaning was "cock's egg," a small or misshapen egg.

Cockpit, in old-time men-of-war, a place situated under the lower gun-deck, where the ship's surgeons tended the wounded. The term is also applied to the open space in a yacht or canoe in which the crew or passengers sit.

Cockran, kōk'ran, **William Bourke**, American lawyer: b. County Sligo, Ireland, 28 Feb. 1854. He came to America in 1871, and taught school for several years, while studying privately for the bar. He soon attained prominence as a lawyer, and entered actively into New York politics, his eloquence causing him to be much in demand as a Democratic public speaker. He was a member of Congress 1891-5, made noteworthy speeches at the Democratic national conventions of 1884 and 1892, at the latter of which he opposed Cleveland's nomination; and in 1896 refused to follow his party on the silver question, campaigning for McKinley, and advocating the gold-standard in effective addresses.

Cock'rell, **Francis Marion**, American senator: b. Johnson County, Mo., 1 Oct. 1834. He graduated at Chapel Hill College, Mo., 1853, studied law, and practised that profession until his election to Congress. During the Civil War he was a brigadier-general in the Confederate army, was severely wounded during Hood's invasion of Tennessee, and commanded a division in the operations around Mobile, Ala. He was chosen United States senator to succeed Carl Schurz, took his seat 4 March 1875, and has been re-elected four times, his present term expiring 3 March 1905.

Cockroach, any of the species of *Blatta* or allied genera, belonging to the family *Blattidæ*, order *Orthoptera*. The body of the cockroach is much flattened, being adapted to life under the bark of trees, under stones, in cracks, etc. The four wings are much alike in size and net-veined; the antennæ are long and slender, and to the end of the body are appended many-jointed antenniform limbs which contain olfactory organs like those in the joints of the antennæ. Cockroaches are hatched in nearly the same form as the parent, differing mainly in not having wings. The eggs are deposited in a bean-like case (*oötheca*), which is divided into two compartments, each containing about 30 eggs; these egg-sacs are carried about for some time by the female, projecting from the end of her hind-body. One small native species (*Platymodes pennsylvanicus*) lives under stones, but the species so abounding in our homes have been introduced from the Old World. The peculiar odor given out by cockroaches is expelled from glands in the hind-body, and either present in both sexes, or only in the males. In the croton bug, or common small cockroach of our cities, these glands are very large, giving out a fœtid odor, and occur only in the males.

While nearly a thousand species of blattids are known to be now living and 200 fossil species are described, mostly from Palæozoic strata, chiefly the carboniferous states, several forms are household pests. They swarm in our kitchens, spreading through those parts of the house warmed by hot water or steam pipes, and are troublesome from eating clothing, cereals, devouring the paste in bindings of books; they also abound in ships, where they devour ship biscuit, etc., impregnating the pantry with their disagreeable odor. On the other hand, the cockroach is an enemy of the bed bug, doing great service in reducing their numbers. The development of the cockroach is slow and the number of eggs deposited not great. *Phyllodromia germanica*, the German roach or croton bug, reaches maturity in from four and a half to six months.

Of the many species known the most annoying is the German roach, whose native country is, however, not known, though supposed to have had an eastern origin. The Oriental cockroach (*Periplaneta orientalis*) is derived from tropical Asia, and is supposed to have been introduced into Europe two or three centuries since. The female is nearly wingless, it is a large dark brown species, living in colonies. The best remedies are insect powder, phosphorus paste, and a proprietary substance called German snowflake powder. Consult the text-books on entomology; also Howard and Marlatt, 'The Principal Household Insects of the United States.' (Bulletin No. 4 U. S. Department of Agriculture, Division of Entomology. Washington, 1896.)

Cock's-foot Grass. See GRASSES IN THE UNITED STATES.

Cocks'comb, a name sometimes given the genus *Celosia cristata* of the amaranth family *Amaranthaceæ*. It is an annual plant, native in the tropical regions of America, Asia, and the East Indies. The naturalized plant from tropical America is found during the months of August, September, and October as a weed or herb in waste places, also in cultivated ground, throughout the United States. The cultivated plant grows with an upright stem bearing a

brilliantly colored and wavy crest, formed by the minute flowers on the surface of the pointed bracts.

Cockswain, colloq. kōk's'n, the officer who manages and steers a boat, and has the command of the boat's crew.

Cock'ton, Henry, English humorous novelist: b. London 1807; d. 26 June 1853. His stories were very popular in their day, the most noted among them being 'Valentine Vox, the Ventriloquist' (1840).

Cocles, kō'klēz, **Horatius**. See HORATIUS COCLES.

Cocoa. See CACAO.

Cocoa Butter. See CACAO.

Cocoanut, or **Coconut**, a palm tree (*Cocos nucifera*) native of islands in the Indian Ocean, but widely distributed in warm countries throughout the world. Geology shows that it had a wider distribution than at present, since specimens have been discovered in Central and South America. The tree grows naturally upon sandy soil bordering the sea or not far inland except where planted by man. It is remarkable as one of the first tree species to gain a foothold upon newly formed tropical islands. Its stem, which often attains a height of 100 feet is crowned by a rosette of long pinnatisect leaves from 10 to 20 feet long, gracefully curving upward at their bases and downward at their tips. From among the bases of the leaf-stems appear large pointed spathes from which proceed yellow or white flowers followed by large hard-shelled nuts. Several of the spathes in various stages of development are usually found upon the trees, which often commence to bear when less than 10 years old and continue productive for more than half a century, yielding about 100 nuts as an annual crop.

Since the tree does not produce well when remote from the coast, it is planted along the shores upon sandy or shelly land where little else of value will grow. The seeds are the sole means of propagation. They are planted in rows in the nursery and when the seedlings are large enough they are transplanted about 20 feet apart, where they are to remain, given clean cultivation for three or four years, and then allowed to shift for themselves, occasional mulches of seaweed, etc., but no manure, being given. The only part of the United States in which the cocoanut palm bears fruit with reasonable certainty is the extreme south of Florida, but even there it has not become commercially important. It may be taken as an index of the dividing line between the tropical and sub-tropical regions, since it thrives best in regions where frost never comes.

This palm is one of the most important economic trees of the world. Its fruit is a staple food either ripe or unripe, raw, or prepared in various ways, in many tropical countries. It is also exported to temperate climates, where the nuts are used in confectionery and for cake and dessert-making. The oil, of which there is about 70 per cent in the nuts, from which it is obtained by expression or heating in water, is largely used for making soap and candles and for food. (See COCOANUT OIL.) The central part of the stems of young plants is used for food, as is also the terminal bud or "cabbage." A drink and a kind of

sugar are made from the sap of the young spathes. The dried leaves are used for thatching, baskets, mats, etc., and the petioles for oars. The wood in the lower portions of the trunks of old trees is commercially important under the name of "porcupine wood," which is used in cabinet-making, etc. The fibrous centres of old stems are used for cordage-making, as is also the fibrous husk of the nuts (see COIR). This latter is widely used for making cocoanut-matting, which is put down in corridors where there is a great deal of tramping. It is exceedingly durable. The cocoanut shell is used for drinking cups, bottles, etc., and for ornament when carved and polished. The fibre of the husks is used by florists as a moisture-retaining medium in which to plunge potted plants and in which to propagate various seedlings and cuttings.

Cocoanut Crab. See ROBBER PALM.

Cocoanut Oil, a solid vegetable fat, largely used in candle-making and in the manufacture of soaps and pomatum. This fat is expressed from the albumen of the cocoanut kernel, and is as white as lard, and somewhat firmer. From Manila and Ceylon large quantities of the oil are exported.

Cocoa-plum, the fruit of *Chrysobalanus icaco*, belonging to the family *Rosaceæ*, which is eaten in the West Indies. It is about the size of a plum, with a sweet and pleasant though somewhat austere pulp. The root, bark, and leaves of the plant are employed as remedies in diarrhœa and other troubles. It has simple, alternate leaves and cymose flowers.

Cocoa (kō'ko) **Root**. See COCCO.

Coco de Mer, or **Sea** or **Maldivé Double Cocoanut**, the fruit of the *Lodoicea seychellarum* palm. Its double kernel has long had an extraordinary value over a large area in the East. As a sovereign antidote to poison, and long known only from specimens thrown up on the Maldivé coasts, it was supposed to grow on a submarine tree, and had other fables attached to it. The tree on which it grows is peculiar to some of the Seychelles Islands, reaches a height of 100 feet, and has very large fernlike leaves.

Cocoon, kō-koon', the web or ball spun by caterpillars before passing into the chrysalis state. The valuable product thus obtained from the silk-worm is well known. Also the silken case spun by spiders for the reception of their eggs.

Cocos, a genus of palms. There are about 30 species, natives, with one exception (*C. nucifera*), of South America, but cultivated for their fruits or for ornament in many warm countries. They vary considerably in height, but are all characterized by absence of spines, ridged trunks, pinnatisect leaves in a terminal crown or rosette, spadices erect at first, but later drooping, spathes two, flowers white or yellow, fruit of various forms. Some species are cultivated under glass on account of their graceful foliage. The most important species of the genus is unquestionably *C. nucifera*, the coco palm or cocoanut tree (see COCOANUT). Of the other species the following are perhaps best known in the United States. *C. flexuosa*, a medium-sized Brazilian species often planted in southern Florida and southern California as a street tree and to some extent cultivated in northern greenhouses. *Ceriospatha*, a stouter, somewhat taller

COCOS-KEELING — COD

species from southern Brazil, by some considered the hardiest of the genus and often planted along avenues in the regions mentioned and in the West Indies. It is little cultivated under glass because of its rather coarse leaves. *C. datil*, an Argentine species, found to be hardy in southern California as a street tree. Its fruits which are edible, resembling those of the date palm. *C. plumosa* is the most generally cultivated street tree of the genus; it is of quick growth, soon reaching a height of 30 feet, and, with age, 50 feet. It is indigenous to central Brazil. *C. medalliana*, a dwarf species from central Brazil, is unquestionably the most popular greenhouse palm, not only of the genus, but of all genera. Its foliage is small, delicate, and graceful, and on this account it is frequently used as a table decoration. It is probably the most easily cultivated of the palms used in house decoration, and since it is of slow growth it retains its beauty for a considerable time, never becoming coarse or unattractive.

Cocos-keeling (kō'kōs-kē'ling) **Islands**, British India, a group in the Straits Archipelago, being a little horseshoe-shaped cluster of isles lying south of Java at about the distance of a three days' sail by steamer. The group is little known, but is said to be among the most picturesque in the British empire. The inhabitants, numbering about 600, are divided between the Cocos natives and coolie laborers from Java. The islands have a romantic history. A Scotch sailor named Ross landed here in 1825 and established himself as ruler; in 1851 he hoisted the British flag; but in 1857 the islands were formally annexed to Great Britain; and authority over them still remains in the hands of the Scotch sailor's descendants. An enlightened civil government is maintained; schools have been established; and industries connected with cocoanut and other products are carried on.

Co'cum-butter, or **Cocum-oil**, a pale, greenish-yellow solid oil obtained from the weeds of *Garcinia purpurea*, a tree of the same genus with mangosteen, used in India to adulterate ghee or fluid butter.

Cocy'tus (from Gr. *kōkuein*, to lament), a river of ancient Epirus which falls into the Acheron. Also, among the ancient Greeks, one of the rivers of the lower world. Pausanias advances the following conjecture respecting this river: "At Cichyrus is Lake Acheron, with the rivers Acheron and Cocytus, whose waters are very ungrateful to the taste. Homer, I imagine, had seen these rivers, and in his bold description of hell gave to the streams in it the names of those in Thesprotia."

Cod, the typical representative (*Gadus calarias* or *Gadus morrhua*) of a family (*Gadidae*, q.v.) of marine fishes of pre-eminent economic importance. Although most widely and generally known as the codfish, or simply cod, perhaps not less than 50 other names are applied to it more or less colloquially, many of them derived from the same root as cod. The cod is moderately elongated, heavy in front, with a large head, and tapering gradually into a slender tail terminated by a slightly notched fin. There are three dorsal fins, none of which is elevated, and two anals, and the ventral fins are normal in structure and placed far forward on the throat. The mouth and eyes are large, and the chin bears a long barbel. Very small scales

cover the entire body and most of the head. Although varying much in shade, the color is usually reddish-brown with small rounded spots of darker brown and a conspicuous pale lateral line. Unlike the haddock, all of the bones of the shoulder girdle are thin and lamellar; much variation in size has been observed, certain localities and schools always yielding large fish, others small or mixed ones. An average length is from three to four feet; and the weight from 7 to 40 pounds, but very much larger ones, several exceeding 100 pounds, and one of 160 pounds, have been recorded.

The cod is a fish of cold waters, apparently preferring a temperature of from 35° to 45°. Whether there is more than a single species is doubtful, though it is well known to fishermen and ichthyologists that the Alaskan cod have much larger swimming-bladders than those of the Atlantic. Waiving this question, the cod may be said to have a circumpolar distribution, ranging south in the Atlantic as far as the Bay of Biscay on the European side, and to Cape Hatteras on the American shore. In the Pacific it is abundant in the waters of Alaska and Bering Sea, and occurs on banks off the mouth of the Columbia River, though there are no cod fisheries at the latter point. Northward they are found to at least 80°, and probably beyond. Sometimes it will even enter fresh water, ascending rivers, as was formerly frequently recorded in the Delaware, perhaps in pursuit of food. That any north-and-south migration takes place is doubtful, but seasonal migrations between deep and shallow waters, and irregular ones in search of food, are well known both on our coasts and on those of Europe. Thus Prof. Sars has described the so-called "mountains of fish" which annually approach the coast of Norway. North of Cape Cod the fish approach the shores during the summer and retire, upon the approach of cold weather, to the deeper waters of the off-shore banks, where they are followed by the Gloucester fishermen. On the shores of New Jersey and Virginia no cod are found except during the winter, the shallow waters becoming so warmed in summer that they are driven seaward to the cold Labrador current. Rocky and stony banks, where a rich fauna has congregated at moderate depths to about 120 fathoms, are the favorite resorts of the cod, but considerable numbers are taken down to 250 fathoms on the edges of the outer banks, and the trawl has brought up cod from a depth of 300 fathoms.

Little need be said concerning the food of the cod. It devours everything of an animal nature that it comes across, and a mere list of the species which have been taken from its stomach would fill a volume and be little short of a catalogue of marine animals. Great clams are swallowed in their shells, and, after being digested, the hard parts are regurgitated in such numbers that the bottom over large areas is said to be paved with them. Spawning takes place at moderate depths, but the buoyant eggs rise to the surface, where they float until hatched. On the European coasts the spawning season is in March and April, but with us during the winter. The fecundity of the codfish is truly astounding, not less than 9,100,000 eggs having been estimated to be produced in a single year by a 75-pound fish, while 2,000,000 to 4,000,000 is the average yield of those of ordi-

COD

nary size. The eggs are small, about one seventeenth of an inch in diameter, and, although buoyant, have no oil globule, as do many other pelagic eggs. They hatch in from 12 days to 3 weeks, and the young fry, which feed on small crustaceans, grow rapidly, becoming about two inches long in four months and about one foot at the end of a year, though the variation in size is very great. That there has been a great decrease in the numbers of cod frequenting the inshore banks is well known, and many suggestions have been made to account therefor. The late Prof. Baird connected it with the decrease in the number and size of the schools of herrings, a favorite food of the cod, itself due to the building of dams and other obstructions which have prevented their entrance into the rivers for spawning purposes. In an attempt to overcome this condition the United States Fish Commission has been engaged for several years in collecting and hatching enormous numbers of cod eggs at its Gloucester and Woods Hole stations, with every promise of a considerable degree of ultimate success. During the winter of 1901-2, the last season for which statistics are available, no less than 338,000,000 cod eggs were thus handled.

Next to the herring, the cod is the world's most important economic fish, and in the United States the most important. During 1901 the aggregate value of the fresh and salt cod landed at Gloucester and Boston, the two largest shipping points, was nearly \$3,000,000, and the total annual value of the cod-fisheries of both sides of the North Atlantic cannot be less than \$25,000,000.

Some idea of the magnitude of the cod-fishing industry may be gathered from the fact that out of a total population in Newfoundland of 220,000, more than half that number gains its livelihood from it. The Newfoundland cod fisheries are the oldest in America, and a description of the methods pursued there may well represent those of other and younger stations.

The island was discovered, or, granting an earlier discovery by the Northmen, rediscovered, by John Cabot, 24 June 1497. Soon after this event Portuguese, French, Basque, and Spanish fishermen established fisheries on its shores. When, in 1583, Sir Humphrey Gilbert took possession of the island in the name of Queen Elizabeth, small English colonies were established along the east coast, and several French ones on the southern shore. In 1713 the Treaty of Utrecht declared Newfoundland and its dependencies to belong wholly to Great Britain, but reserved to the French a right to fish and cure on parts of the coast, now known as the "French shore," extending from Cape St. John on the east to Cape Ray on the southwest. This reserved right has given rise to many complications, but more with respect to the lobster fishery than the cod industry. Of such prominence is the cod in the social economy of the island that the local courts have determined that the word "fish," if unqualified, must be deemed to mean codfish, which, in the northern and southern coast settlements, is so often used as an equivalent of money as to be called "Newfoundland currency." It is measured by the quintal of 112 pounds, and in this form pays for food, clothing, and medicines, as well as fees for physician, the clergyman, and the lawyer. The fish "flakes" (see below) are so

numerous in all the towns, that it would be impossible to guard their contents; so stringent laws have been passed to prevent theft, and the convicted thief is frequently sentenced to several years' imprisonment, though he may take but a single fish.

While Newfoundland craft are to be seen in numbers upon the Grand Banks, during the last few years the crews have confined their operations largely to the waters in the vicinity of the island. Although the cod are somewhat smaller, they are fully as numerous and of excellent quality, while, in a good season fish weighing 10 or 12 pounds are frequently caught. The vessels range in size from the schooner, 125 feet long and over 100 tons burden, to the sailboat manned by two men, who cast their lines or set their nets under the lee of the rocky shores perhaps not more than 500 feet from land, for schools of fish are to be found in proximity to the coast as well as 100 miles away from it, depending largely upon the course of the Labrador current, which furnishes their principal food supply. The larger vessels are schooner-rigged, and usually carry two jibs, a mainsail, foresail, and main topsail, with sometimes a small jigger extending over the stern, and staysail rigged between the two masts. In addition, they carry a triangular riding-sail to assist in steadying them when at anchor. The larger ones are manned by from 15 to 30 men, provided with lines for deck-fishing as well as with set-lines and trap-nets. Each carries its complement of boats, and, on arriving at a fishing-ground, a part of the crew throw their lines over from the deck, while others bait and put out the set-lines and the trap-nets from the smaller boats, visiting them at regular intervals to gather in the fish, which are taken to the schooner to be hastily cleaned, salted, and packed in the hold until the "fare" is completed. The captain usually keeps his boat anchored as long as the school which has been "struck" remains. The fish may stay on one feeding-ground four or five days, or perhaps disappear in four or five hours after the vessel has cast anchor. Then the set lines and nets are taken up, the vessel weighs anchor, and search for another school begins.

In offshore fishing the trap-net is also used in addition to set-lines, and the larger boats occasionally use hand-lines as well, if the fish bite freely. A very large catch is made, however, with the set-lines and nets, and the boatmen go out every morning to take out the fish and bait the hooks, perhaps paying another visit in the evening. Upon the return of the men to the home settlement with their boatload of fish, the women and children join them in cleaning the fare, salting it, and spreading it on "flakes" to dry. At times the fishing is so good that the men make three and four trips daily to the nets and lines, carrying home a good load on each trip. Then the women and children prepare the fish in order to save time.

The time required to cure the codfish varies from 4 to 10 days according to the weather. With a succession of sunny days, the fare will be thoroughly cured in less than a week, but the fish must be protected against rainy weather, in spite of the salt with which they are rubbed after being cleaned.

The "flakes" are composed of platforms of boughs, elevated from 6 to 10 feet above the ground upon scaffolding; and the fish are laid

COD-LIVER OIL — CODAZZI

upon the boughs so closely together, that at a distance the "flakes" look as if they were covered with pieces of white canvas. Each fish is turned over at least once every 24 hours, in order to cure both sides thoroughly; and when the process is completed the fish is as stiff as a piece of board. No other ingredient except salt is required for the ordinary curing, although some of the cod prepared at the larger settlements are ground into fine particles after being dried, and mixed with a jam made of small berries. This is placed in jars and sold as a preventive of scurvy. The fares secured by the larger vessels remain in their holds until the cargo is completed. On arrival at St. Johns, or the home port, the cargoes are sold, in a partly cured condition, to the merchants, who finish the preserving process. In buying the fish from the large vessels, as well as from the fishermen in the settlements about the coast, the cod are valued according to their weight, and generally sorted in three different sizes, the largest bringing a proportionately greater price. The merchant, as he is known in Newfoundland, is the large dealer who exports the fish to the tropics and Europe. He buys from both the fishermen and the "planters." The latter are a sort of middlemen, and usually have "stations" located at different points along the coast. These stations include general stores containing everything required by the fishermen. The people in the vicinity can go to the station and exchange their harvest for what they need at home and the outfit required for fishing, and, if anything is left to their credit, can obtain its equivalent in money. Many of them, however, are usually in debt to the planter, and, in a good year, the surplus remaining after obtaining their necessities goes in payment of the debt of a previous season. The planters also buy schooner loads, and many of them own steamers and sailing vessels which make regular trips around the island, carrying the fish purchased by the planter to the general market at St. Johns or one of the other large towns.

While the number of cod caught varies considerably according to the season, the average catch is from 1,250,000 to 1,500,000 quintals, the value, of course, depending on the price. Within the last two or three years the revenue from this source has aggregated about \$5,000,000, not counting \$300,000 for codfish oil, and a small sum for the oil derived from the livers of the codfish for use in medicine. The number of crews engaged in codfishing can only be estimated, owing to the variety of craft and the wide field of their operations. Authorities on the subject, however, estimate that fully 60,000 men are engaged in the fishery each year, and that a fleet of fully 1,000 two-masted vessels, hailing from the island alone, ply upon the nearby waters and on the Banks. Practically all of these vessels are home-made, the wood for both hulls and spars being secured from forests in the interior, while the sails and rigging are imported chiefly from England. For a full account of the natural history of the codfish, consult Goode, 'American Fishes'; and for statistics of the fisheries and other information, the 'Annual Reports' of the U. S. Commissioner of Fish and Fisheries.

Cod-liver Oil, an oil extracted from the livers of different kinds of cod—the *Gadus*

morrhua being specified in the pharmacopœia — and allied species. It has a fishy taste and odor, is insoluble in water, but dissolves in ether, and is colorless or pale yellow. The tint, however, depends on the mode of preparation, some kinds being pale brown, and others dark brown. The finest and palest oil is produced from fresh and carefully cleaned liver, the oil being extracted either in the cold or by a gentle heat. The darker kinds are obtained at a higher temperature, and often from the livers in a putrefying state. Only the pale oils are used in medicine, the dark oils are too rank and acrid, and they are only used in dressing leather. The oil is prepared in Great Britain, in Newfoundland, and in Norway, and it has also been prepared in Iceland.

Cod-liver oil has a specific gravity of 0.93. It is a somewhat complex substance, but the main ingredients appear to be olein and margarin. Acetic, butyric, and other acids are also present, and to these the oil may owe some of its odor. It contains, besides biliary matters, a peculiar body called gaduin, and inorganic substances, including minute quantities of iodine, bromine, sulphur, and phosphorus. It is questioned, however, whether iodine and bromine are constant constituents.

In medicine cod-liver oil is very highly prized, because it is a readily assimilable fat, splitting readily in the intestines and easily digested. Perhaps next to milk fat or egg fat it is one of the most easily taken up of the fatty bodies. It is therefore particularly valuable in the treatment of the chronic wasting diseases, proving especially serviceable in consumption. It is also of service in weak, puny children, and can be taken to advantage by adults with chronic nervous disorders. In fact cod-liver oil is very valuable in most affections of the nervous system. As it is the fat in cod-liver oil that is valuable the various forms of proprietary preparations on the market that claim to contain the active principles without the oil should be looked upon with suspicion. The oil is usually very unpalatable; hence the many emulsions that are put up. These, if they contain the pure oil in reasonable quantities, are excellent. There are many commercial cheats in cod-liver oil, and reliable preparations only should be used.

Codazzi, Agostino, ä-gōs-tē'no kō-dät'sē, Italian engineer: b. near Ferrara 1792; d. Colombia June 1859. He made several campaigns under Napoleon, and afterward distinguished himself as an engineer in South America. He entered the Colombian service with the rank of lieutenant-colonel of artillery, and was employed in making charts and in preparing plans of defense. In 1831 he was appointed by Paez to prepare partial charts of the new republic of Venezuela. This work occupied nearly nine years, and was twice interrupted by military defensive expeditions, in which Codazzi took part. He was rewarded with the rank of colonel. He devoted the years 1838-9 to exploring the wilderness of Guiana, and penetrated nearly to the sources of the Orinoco. The important additions to geography which were obtained from this expedition induced the congress of Venezuela to furnish him means to make public the result of his labors. For this purpose he went to Paris, where his work appeared in 1841, entitled 'Resumen de la Geografia de Venezuela,' accompanied by an

CODDINGTON — CODE

extensive chart of Venezuela. Codazzi afterward established a German colony in Venezuela. In 1848 he was employed by the government of Colombia in a topographical survey of that country.

Cod'dington, William, New England colonist: b. Boston, Lincolnshire, England; d. Rhode Island 1 Nov. 1678. He was one of the founders of the colony of Rhode Island. He arrived in Massachusetts in 1630, remained in Boston for several years, but not being able to agree with the authorities of the colony, he removed in 1638 to Aquidneck, or Rhode Island, where he founded a colony to be governed "by the laws of the Lord Jesus Christ." It was soon found necessary to abandon this vague scheme, and in 1640 he himself was chosen governor, and in 1647 aided in the formation of a regular body of laws. He was unable to secure the reception of Rhode Island into the colonial confederacy. In 1674 and 1675 he was again elected governor.

Code, a term now generally confined to jurisprudence, and used to designate a systematic compilation of law authorized by governmental authority to take the place of prior existing law. It is in this sense applied to the codes of Theodosius, Justinian, and Napoleon. The word is used more generally in the United States as applied to a concise, comprehensive, systematic formation and re-enactment of the law, deducted from both its principal sources, the pre-existing statutes, and the adjudications of courts as distinguished from compilation of statute law only. Codes such as here described have been adopted and are in use in many of the States. They are, in the most part, modeled upon the Code of Civil Procedure of New York. The purpose of a code is to simplify methods of legal procedure and to model and bring together in a codified form the confused mass of laws, contradictions, repetitions, and disorder which have grown up during a long period of time. Such a codification of law has always been deemed a most difficult task, and though many times agitated in England, it has never been earnestly undertaken, and is not likely to be for some time. The same causes which made such a codification necessary in the time of the Emperor Justinian exist to-day in many countries and in most of the States of the United States. While the *Corpus Juris Civilis*, or body of civil laws, drawn up by Justinian's commission of 10 learned civilians, was the most important and complete of ancient codes up to that time, there had been other compilations under the empire. These compilations had been made by private lawyers, and formed the basis of the *Codex Gregorianus et Hermogenianus*, which in turn were the models for the imperial codes of Theodosius and Justinian.

The *Codex Theodosianus* was the work of a commission of 16, to whom, in 435 A.D., the Emperor Theodosius entrusted the task of collecting the edicts and constitutions. It was published in 438 A.D., was a work of great importance, and formed the masterpiece on which every later code was based. It was the initiative of a digest of the whole Roman law. In 528 the Emperor Justinian ordered a new collection to be made, and for this purpose appointed 10 commissioners with full power to make such changes as they might deem neces-

sary in the language of the constitution. They were authorized in their compilation to use the codes, Gregorian, Hermogenian, and Theodosian, and the constitutions, with the understanding that the new code was to supersede the sources from which it had been compiled. The Code Justinian was completed within 14 months, and was subsequently revised to take in new decisions and constitutions of the emperor. The original code was lost. The revised one, which has been preserved, was published in 534, and is divided into 12 books and each book into titles.

Code Napoléon.—The civil code of France in force at the present day takes its name from the great Napoleon. It was undertaken under the consulship of Napoleon by the most eminent jurists of France, and was published in 1804. It is the most celebrated of modern codes. The *Code Napoléon* (under which name four other codes of commercial law, criminal law, penal law, and the law of procedure, drawn up at the same time, are often included) was a code in the fullest and strictest meaning of the word, in that it was not merely a collection of the law, but was a complete and thorough statement of the law. The need of a codification of the laws of France had been urged by eminent jurists and statesmen for some time before Napoleon took the matter up and carried it through. Previous to the adoption of the *Code Napoléon* there had been some partial codes in France; such as the *Code Henri*, made by Brisson in the reign of Henry III.; the *Code Murvillac* or *Michau* under Louis XIII. (1629), relating to judicial procedure, and the *Code Louis XV.*, by Chaussepierre, containing the ordinances from 1722 to 1740. There were several of these ordinances enacted in the reign of Louis XVI. No decided move was made to bring about a codification of the confused condition of the laws of France for the purpose of shaping them into a homogeneous jurisprudence until the Revolution had cleared the way. By the consular decree, 12 Aug. 1800, a commission was constituted to compare the order which had been followed in the preparation of the projects for a civil code "hitherto published, to determine the plan which the commissioners should think best to adopt, and to discuss the chief principles of civil legislation."

Napoleon, on becoming consul, appointed a commission headed by M. Tronchet, and including Portalis, Bigot de Préameneu, and Maleville, to review all previous efforts at codification and to suggest a new plan. In 1801 the commissioners reported a draft for a civil code, which was submitted to the court of cassation and other courts of appeal, and with the reports of the judges, was finally brought before the council of state, in which Napoleon (then first consul) presided in person and took part in the discussion as to the terms and scope of the code. The whole revision after much debate was finally adopted under the title of *Les Cinq Codes*, consisting of the civil code, distinguished by the name *Code Napoléon*, the code of criminal procedure, penal code, the code of civil procedure, and the code of commerce. The entire work was first published under the title *Code civil des Français*, but Napoleon subsequently had it published as the *Code Napoléon*, as he considered the code one of the crowning glories of his reign. The *Code*:

CODE OF KHAMMARUBI—CODE NAPOLEON

Napoléon consists of 2,281 articles. It has been said of this code that it is the product of Roman and customary law, together with the ordinances of the kings and the laws of the Revolution. Although political upheavals have caused some changes and modifications, the code remains virtually the same as when it left the hands of its framers. The extent of its influence upon the laws of other countries has been very great, as it formed the basis of the codes of the two Sicilies (1819), the Netherlands in 1837, the Swiss cantons from 1819 to 1855, Bolivia in 1843, and the civil code of the State of Louisiana.

Code Frederic.—This is a revision of the Prussian laws, published by Frederick the Great 1749–51, and revised after 1780, but not in force until 1794, was intended, according to its preface, to obviate the difficulties of the Roman codes, the disputes of the commentators, and the contradictions between Roman and German law. It has been subjected to many changes.

Codes in the United States.—The first important experiment with a code in the United States was made in Louisiana, which State, originally a French colony, afterward ceded to Spain, again returned to France, and subsequently acquired by the United States from France, has had many changes of law. After the United States acquired Louisiana there arose a strong demand for a code, owing to the great confusion of laws. In 1806–8 a code was adopted, but only to supersede the ancient laws when they conflicted with it. A complete civil code was adopted for the State in 1824, which had for its basis the *Code Napoléon*, although some provisions of the common law were injected into it.

The most important code ever undertaken in the United States is the one which was prepared for the State of New York many years ago under the guidance and supervision of David Dudley Field. This code, although published, and having formed the foundation for many of the codes adopted by the various States, was never accepted by the legislature of New York. As early as 1839 David Dudley Field advocated and urged the adoption of a code by that State. The revised constitution of New York (1846) ordered the appointment of two commissions: one to reduce into a system the whole law of the State, the other to revise and simplify the rules of pleading. Both commissions were appointed by the legislature in 1847. The commissioners to revise and simplify pleadings and practice made a report on 27 Feb. 1848, which contained an incomplete code of civil procedure and practice in the courts of record. This report was immediately adopted by the legislature, but the complete codes of civil and criminal procedure were never adopted. On 6 April 1857, the legislature created a new commission to prepare codes. The commissioners named were David Dudley Field, William Curtis Noyes, and Alexander W. Bradford. After some eight years they reported a code—or rather three codes—which was never adopted, although reported favorably by the committees of several legislatures.

The code of civil procedure of the David Dudley Field commission formed the foundation, and was largely adopted in the codes of Ohio, Indiana, Missouri, Wisconsin, Iowa,

Minnesota, Kansas, Nebraska, Nevada, California, Oregon, North Carolina, South Carolina, Washington, Montana, Alabama, the Dakotas, Wyoming, Utah, and Arizona, and it is the basis of the present codes of civil and criminal procedure in the State of New York, which are codes of practice and pleading, as distinguished from a code of substantive law. The principal feature of the code of civil procedure as adopted by these States was the fusion of law and equity and the simplifying of the written pleadings.

LEWIS P. CLOVER.

Code of Khammurabi. See HAMMURABI.

Code Napoléon, a code of laws in France, framed by a committee appointed by Napoleon Bonaparte when first consul. This committee, consisting of Portalis, Bigot-Préameneu, Malleville, Tronchet, and the minister of justice, was directed by a decree dated 24th Thermidor, VIII. (13 July 1800),—

—to compare the order which had been followed in the preparation of the projects for a civil code hitherto published, to determine the plan which the committee shall think best to adopt, and to discuss the chief principles of civil legislation.

In the following year, 1801, these commissioners reported a draft of a civil code, which was in the first instance submitted to the court of cassation (q.v.) and the various courts of appeal. With the reports of the judges of these courts the draft was submitted to the council of state, over which the first consul presided, and in which every part was thoroughly discussed. In the work entitled 'Conférence du Code Civil, avec la Discussion Particulière du Conseil d'État et du Tribunat, etc.' (8 vols. Paris 1805), a detailed and very carefully prepared report of these discussions is contained. Each article, after having been discussed in this body, was presented to the tribunate, where it underwent another discussion, and was returned to the council of state as adopted, rejected, or amended.

Of the five codes prepared in this way, namely, the 'Code Civil,' published in 1804; the 'Code de Procédure Civile,' published in 1806; the 'Code de Commerce,' published in 1807; the 'Code d'Instruction Criminelle,' published in 1808; and the 'Code Pénal,' published in 1810; the first was called by way of eminence, by a law of 3 Sept. 1807, 'Code Napoléon.' At the restoration its name was changed back to 'Code Civil,' and during the time of the second empire it was again called 'Code Napoléon.' It is divided into 2,281 paragraphs, which are numbered, and consist of a few lines each. The work is divided into three books (livres); each book into a certain number of titles; each title is comprised in one or more chapters. A preliminary title, 'On the Publication, Effects, and Application of the Law in General,' precedes the whole. The first book is entitled 'Of Persons,' and in 11 titles treats, (1) of the enjoyment and privation of civil rights; (2) of civil acts, such as the registry of births, marriages, and deaths; (3) of domicile; (4) of absentees; (5) of marriages; (6) of divorce; (7) of the relations of father and son; (8) of adoption and official guardianship; (9) of the paternal power; (10) of minority, guardianship, and emancipation; (11) of majority, of guardian-

CODEINE — CODEX ARGENTEUS

ship of persons of age (interdiction), and judicial counsel. The second book is entitled 'Of Property and the Different Modifications of Ownership,' and in four titles treats, (1) of the distinction of property into real and personal (*immeubles et meubles*); (2) of ownership; (3) of usufruct, of use and habitation; (4) of servitudes (easements, *des servitudes ou services fonciers*). The third book is entitled 'Of the Different Modes of Acquiring Property,' and in 20 titles treats, (1) of successions; (2) of donations *inter vivos* and testaments; (3) of contracts, or conventional obligations in general; (4) of engagements formed without a convention; (5) of the contract of marriage, and the rights of the parties respectively; (6) of sale; (7) of exchange; (8) of the contract of letting to hire; (9) of partnership; (10) of loan; (11) of deposit and sequestration; (12) of contracts connected with chance (*aléatoires*, such as wagers and life-rents); (13) of powers of attorney; (14) of becoming security; (15) of transactions; (16) of bodily duress in civil cases; (17) of furnishing security; (18) of mortgages; (19) of taking and setting off by execution; (20) of prescriptions.

The work already quoted, 'Conférence du Code Civil,' is indispensable to a complete understanding of the code, because it gives the history of each law. It first presents each article in the code as finally adopted. Next follow the different forms and drafts of each article discussed in the council of state, with the report of the discussions. To this succeed the observations made in the section of legislation of the tribunate. We learn from this work how active a part Napoleon took in the formation of the code, as his remarks are given as well as those of the others, and he was present during almost the whole of the debates. Under the first empire the adoption of the 'Code Napoléon' was made obligatory on all the countries subject to the French. After the battle of Leipsic, in 1813, which freed Germany from the power of France, it ceased to be obligatory in the German states, but it continued to influence considerably their legislation. At present this code is recognized in the kingdom of Belgium (with some modifications), in the grand-duchy of Baden, in the kingdom of Italy, and elsewhere in Europe. In the United States it was a model for the code of Louisiana.

Code'ine, Codein, Codeina, or Codeia (Gr. κώδεια, "poppy-head"), a vegetable alkaloid closely allied to morphine and constituting about 0.5 per cent of the weight of opium. Codeine has the formula $C_{17}H_{18}(CH_3)NO_3 + H_2O$, and is known to the chemist as methylmorphine, since it is derived from morphine by substituting methyl (CH_3) for one atom of the hydrogen that morphine contains. Codeine may be prepared by adding calcium chloride to an aqueous extract of opium and evaporating to the point of crystallization. The hydrochlorides of morphine and codeine which are obtained in this manner are dissolved in water, and the morphine is precipitated by the addition of ammonia. Codeine hydrochloride remains in solution, and may be obtained by evaporation and crystallization, and further purified by recrystallization from ether. Codeine acts as a strong base, and its solution reddens litmus paper, neutralizes acids, and precipitates solutions of lead, iron, and copper.

From aqueous solution it is deposited in the form of trimetric crystals, as indicated by the formula given above. Crystals free from water may be obtained by deposition from a solution in carbon disulphide. When treated with strong sulphuric acid and a small quantity of ferric chloride ($FeCl_3$), codeine compounds give an intense blue color. This reaction is of great value in testing for the presence of the alkaloid. Codeine is used in medicine as a narcotic and hypnotic. Its properties are very similar to those of morphine, but by reason of the methyl groups introduced it has more action on the spinal cord than morphine has. It thus does not cause sleep or relieve pain as readily as morphine, and causes more reflex excitability. It may even cause convulsions in children. It is valuable where a milder sedative than morphine is desired, as there is less euphoria produced and less likelihood of forming a habit. Its use is not free from danger, however, and very small doses have been known to prove fatal.

Codemo, Luigia, loo-e'jē-ä kō dā mō, Italian novelist: b. Treviso 5 Sept. 1828. In 1851 she became the wife of the Chevalier Karl von Gerstenbrand. Her first work, 'Memoirs of a Peasant' (1856), evinced a true insight into lowly life; and in the numerous sketches and tales that followed it, she showed a profound sympathy with the common people. Her writings have passed through several editions. Among her works are: 'Miseries and Splendors of the Poor'; 'The New Rich'; 'A Lady of Heart.'

Co'dex, with the ancients, the trunk of a tree stripped of the bark. Before the invention of paper, wooden tablets covered with wax, which were written on with the style, and put together in the shape of a book, were called codex. The word was afterward retained, in times when paper was used for writing, to denote a large book. Thus important works, particularly old manuscripts of poets, historians, etc., which had been preserved, were called *codices manuscripti*. In like manner a collection of laws was called codex, with the addition of the name of the sovereign under whom, or of the person by whom it had been compiled, as *Codex Gregorianus*, *Codex Theodosianus*, *Codex Carolinus*.

Codex rescriptus (Latin, a re-written codex) is the name given to ancient manuscripts, which, in the Middle Ages, were used, after the original writing had been in a great measure effaced, for the copying of other works, generally ecclesiastical treatises. Thus the Institutions of Gaius, discovered by Niebuhr at Verona in 1816, and published by Göschen in 1821, is a *codex rescriptus*. Some skill is required to read the ancient letters under the others. The Greek name for *codex rescriptus* is *palimpsest*, now more frequently used. The biblical writings themselves have been sometimes effaced to make way for homilies and legends. One of the oldest manuscripts of the New Testament, designated by the letter C, is a *codex rescriptus*, on which the works of Ephraem Syrus have been written. See PALIMPEST.

Codex Argenteus, a translation of parts of the Bible in the Gothic language, attributed to Ulfilas, bishop of the Dacian Goths in the 4th century. It is written on vellum, the leaves of which are stained with a violet color; and on

CODEX SINAITICUS — CODRUS

this ground, the letters, all uncials or capitals, are painted in silver, except the initials, which are gold. The book, however, gets its name from its elaborately wrought silver cover, and not from its lettering. It throws much light on the kindred languages of Germany. The 'Codex' contains only fragments of the gospels and of the epistles of Paul, some psalms, and several passages from Esdras and Nehemiah. It was discovered by some Swedish soldiers in the monastery of Werden in Westphalia, in 1648; then deposited in Prague; afterward presented to Queen Christina, who placed it in the library of Upsala; next carried off by Vossius; and finally restored to the University of Upsala, which regards it as its most precious possession.

Codex Sinaiticus, sī-nā-īt'ī-kūs, a very ancient and valuable manuscript of the Greek Septuagint version of the Old Testament (including the Apocrypha), the whole of the New Testament, the Epistle of Barnabas, and a part of the Shepherd of Hermas, discovered in the monastery of St. Catherine, on Mount Sinai, by the German scholar Tischendorf, 4 Feb. 1859, while traveling in the East by the desire of the Czar Alexander II. When the discovery was made Tischendorf endeavored to persuade the monks to make a present of the manuscript to the czar, and although he was not immediately successful, he was allowed to take it to St. Petersburg on loan. Ultimately, in 1869, the manuscript was formally presented to the czar as Tischendorf had desired. In 1860 an account of the manuscript was published by the discoverer at Leipsic. It is written on parchment in four columns, in early uncial characters, and bears every mark of possessing great antiquity, perhaps being even older than the Vatican MS., which, before the discovery of the Sinaitic MS., was recognized as the oldest known manuscript of the Old and New Testaments. It is assigned by Tischendorf himself to the 4th century. The Old Testament in this manuscript is defective, but the New Testament is complete, not a word being wanting, which is the more remarkable, inasmuch as it is the only manuscript of the New Testament which is complete. From this circumstance, as well as from its great age, it acquires a value in relation to the text of the New Testament, which can scarcely be overestimated. Two gaps in the Old Testament part of the manuscript are curiously supplied by another manuscript which Tischendorf had discovered in the same monastery in 1844, and which he had brought to Germany and named *Codex Friderico-Augustanus*, in honor of the king of Saxony. From this coincidence, as well as the general resemblance of the two manuscripts, it is inferred that the last-named manuscript is really a part of the Codex Sinaiticus, which is generally believed to be the case. A splendid fac-simile of the manuscript was published by Tischendorf under the auspices of the czar at St. Petersburg, in 4 volumes folio, toward the end of 1862. This was followed in 1863-4 by two smaller editions of the New Testament part of it.

Codex Vatica'nus, an ancient Greek MS. of the Old and New Testaments, so called from being contained in the Vatican library at Rome, where it was placed early in the 16th century. It is written on thin vellum, in small uncial characters. In the greater part of the manuscript

there are three columns to a page, and this fact is regarded as one among other indications that it is later than the Sinaitic manuscript, which has four columns to a page. The manuscript is assigned to the 4th century, and until the discovery of the Sinaitic it was regarded as the best manuscript of the Old and New Testaments. The greater part of Genesis in the Old Testament, and the whole of the pastoral epistles and the Revelation in the New Testament are wanting. The first collation of this MS. was by Bartolucci, in 1669. An edition of it by Cardinal Mai was published in 1857, after having been 19 years in print without being published; but it did not satisfy the expectations of scholars. A fac-simile of it was published in 1868.

Cod'icil, an addition to, qualification of, or change in a will. It must be in the same form as a will, and be executed with the same formalities. All the laws applying to wills are the same for a codicil. A codicil properly executed is a republication of the will, and makes the will speak from the date of the codicil. The will and codicil are read together as one instrument. There may be more than one codicil to a will; and where there are several, if the last one is properly executed, referring to a former paper in such a manner as to identify it, that paper, although not properly executed, may be read into the will. See WILL.

Codification. See CODE.

Codil'la, the coarsest part of hemp, which is sorted out by itself. This term is also applied to the coarsest part of flax.

Codlaeum. See CROTON.

Codlin-moth, a moth the caterpillar of which attacks the fruit of the apple (q.v.).

Cod'man, John, American sea-captain and miscellaneous writer: b. Dorchester, Mass., 1814; d. Boston, 6 April 1900. He was the author of: 'Sailors' Life and Sailors' Yarns' (1847); 'The Mormon Country' (1876); 'Round Trip by Way of Panama, etc.' (1879); 'Winter Sketches from the Saddle' (1888); etc., besides many newspaper and magazine articles on current topics.

Codogno, kō-dōn'yō, Italy, a town in a fertile district between the Po and Adda, 17 miles southeast of Lodi. It has a large trade in Parmesan cheese and wheat, and carries on a number of manufactures. The French defeated the Austrians here in 1796. Pop. 10,000.

Cod'rington, Sir Edward, English admiral: b. 27 April 1770; d. London 28 April 1851. He entered the navy as midshipman in 1783, became lieutenant in 1793, and the following year received the appointment of captain. He obtained a gold medal for his services at the battle of Trafalgar, took part in the Walcheren expedition, and was afterward actively employed both in the Peninsular and second American wars. In 1821 he became vice-admiral. His name is principally famous in connection with the battle of Navarino, where he commanded the united squadrons that overthrew the Turkish fleet in 1827. In 1837 he became full admiral.

Co'drus, the 17th and last king of Athens. Tradition tells that during his reign Attica was attacked by the Dorians, or, according to some, by the inhabitants of the Peloponnesus, or the

CODY — CÆCILIAN

Thracians The assailants, inquiring of an oracle what would be the result of their incursion, received for answer that they would be successful if they avoided killing the Athenian king. Codrus, becoming acquainted with this answer, resolved to sacrifice himself for his country. He disguised himself in a peasant's dress, entered the enemy's camp, provoked a quarrel with the soldiers, and was slain. The Athenians, upon hearing of this, sent a herald to demand the body of their king. The courage of the assailants was so damped that they retired without striking a blow. In honor of their patriotic monarch the Athenians abolished the royal dignity, substituting that of a responsible archon, esteeming no one worthy to be the successor of Codrus. They also used his name as a common term to express a man of distinguished excellence.

Co'dy, William Frederick, American scout, hunter, and showman, best known as "BUFFALO BILL": b. Scott County, Iowa, 26 Feb. 1846. His parents moved to the country about Fort Leavenworth, Kansas, where the father was killed in the "Border War" with the Indians when the boy was but an infant. When still very young he was employed by the express companies as a rider to carry packages and valuables on horseback across the country, a most dangerous occupation. Soon he became known as a fearless and perfect rider, a keen scout, a reliable plainsman and hunter. When but little over 21 he attracted the notice of United States army officers, who were constantly in need of the services of expert scouts who could be depended upon and who knew the habits and languages of the red man. In 1868-9 he was made chief of scouts by Gen. Sheridan, then campaigning against the hostiles. Colonel John Schuyler Crosby, then adjutant under Sheridan, says of Cody: "He carried despatches 100 miles for Gen. Sheridan through terrific fire of hostile bands of Indians and returned with replies safely." This and his many personal encounters with the Indians, in some of which he saved the day for the troops, made him a noted man. He is the last of the six great scouts of America — Boone, Crockett, Carson, Bridger, "Wild Bill," "Buffalo Bill." He gained this name from his dexterity as a hunter, his record being 4,862 buffalo in one season — 69 in one day. He continued actively engaged in frontier work for many years, killing the Cheyenne chief, "Yellow Hand" in a celebrated personal encounter during the Sioux war of 1876. Early in the eighties he began the carrying out of a cherished idea — to gather about him some of the remaining elements which went to make up a frontier life and exhibit this unique existence in the eastern States and in Europe. He presently accomplished this end, forming the exhibition called the "Wild West," now known the world over. In this he has gathered scores of Indians, some of whom were once his mortal foes; hundreds of "cow-boys"; the old "Deadwood coach," used so many years to carry mail and passengers, and much other really valuable material. With this gigantic show he has toured America and Europe for nearly 20 years, amassing a fortune which he has invested in lands in Nebraska and Wyoming. In the latter State is a town named after him, on his land. In 1901 he became president of "The Cody Military College and Inter-

national Academy of Rough Riders," a school to be established on his property in Wyoming where young men may learn to ride and become masters of themselves and their horses—a post-graduate school in manhood, as he terms it. In 1872 he was elected to the Nebraska legislature, later became judge-advocate general of the Wyoming National Guard, and, with others, has written: 'The Great Salt Lake Trail.'

Coe, Edward Benton, American clergyman: b. Milford, Conn., 11 June 1842. He was graduated at Yale 1862, studied at Union Theological Seminary 1862-3, and in France and Germany 1864-7. From 1864 to 1879 he was Street professor of modern languages at Yale, and on 2 Oct. 1879 was ordained by the Classis of New York as one of the ministers of the Collegiate Reformed Dutch Church. He was pastor of the Fifth Avenue and West 48th Street Church till January 1899, since when he has been senior minister without charge of a specific congregation. He has published a number of sermons, and a volume entitled 'Life Indeed' (1899).

Coe, George Albert, American educator: b. Monroe County, N. Y., 26 March 1862. He graduated at the University of Rochester 1884, and in theology at Boston University 1887 obtaining the traveling fellowship of the latter college and studying at the University of Berlin 1890-1. He was acting professor of philosophy in Northwestern University 1891-3, when he was elected to the John Evans chair of philosophy there. Besides articles in philosophical and theological journals, he has written 'The Spiritual Life: Studies in the Science of Religion' (1900).

Coe College, an educational institution for both sexes, located at Cedar Rapids, Iowa. It was organized in 1881, under the auspices of the Presbyterian Church, and reported at the end of 1902 that it had 25 professors and instructors, 305 students, and 3,500 volumes in the library.

Cæcilian, or **Cæcilian**, sē-sīl'yān, limbless amphibians, constituting a family, *Cæciliidæ* or *Cæciliidæ*, and an order *Apoda* or *Gymnophiona*. They are remarkable for the entire absence of limbs, even the internal limb girdles having disappeared, and the bony roof to the temporal region of the skull. In the latter feature they simulate the extinct *Stegocephali*, to which some zoologists believe them to be rather closely related, though the temporal roof is formed by different bones. The form is worm-like, and, notwithstanding that the number of vertebræ may exceed 200, the tail is very short. A series of annular scales, somewhat embedded in the skin, protect the body externally, and as a further adaptation to their burrowing habits the eyes are rendered nearly or quite useless by being buried beneath the skin, the deficiency in sight being compensated by the presence of a pair of nearly unique retractile sensory tentacles.

Some species are viviparous, others oviparous. In the case of the latter the female coils about the eggs and protects them until hatched. The young of many are noteworthy in the possession of external gills, while the respiration of the adults is pulmonary. Their food consists principally of earthworms and subterranean insect larvæ.

COEDUCATION

Dr. Boulenger recognizes 17 genera and 40 species, but probably many remain undiscovered. None have been found except in a zone encircling the earth, chiefly within the limits of the tropics; South and Central American species are numerous; but none are certainly known from North America. Consult: Boulenger, 'Proceedings of the Zoological Society of London' (1895); Sarasin, 'Forschungen auf Ceylon' (Vol. II.).

Co'educa'tion, a term meaning joint education, has come to be specifically applied to the education of both sexes in the same class or institution. In the western States and Territories of the United States it is almost the only system of education, and it is rapidly becoming the prevailing system in the South, where the influence of the State universities is predominant. On the other hand, in the New England and middle States the great majority of the youth of both sexes are still receiving a separate college education. Coeducation was introduced into colleges in the West as a logical consequence of the so-called American system of free elementary and secondary schools. During the great school revival of 1830-45 and the ensuing years until the outbreak of the Civil War in 1861, free elementary and secondary schools were established throughout New England and the middle States and such western States as existed in those days. It was a fortunate circumstance for girls that the country was at that time sparsely settled; in most neighborhoods it was so difficult to establish and secure pupils for even one grammar school and one high school that girls were admitted from the first to both. In the reorganization of lower and higher education that took place between 1865 and 1870 this same system, bringing with it the complete coeducation of the sexes, was introduced throughout the South both for whites and negroes, and was extended to every part of the West. In no part of the country, except in a few large eastern cities, was any distinction made in elementary or secondary education between boys and girls. The second fortunate and in like manner almost accidental factor in the education of American women was the occurrence of the Civil War at the formative period of the public schools, with the result of placing the elementary and secondary education of both boys and girls overwhelmingly in the hands of women teachers. This result proved not to be temporary, but permanent, and from 1865 until the present time, elementary and secondary education of both boys and girls has been increasingly in the hands of women. When most of the State universities of the West were founded they were in reality scarcely more than secondary schools supplemented, in most cases, by large preparatory departments. Girls were already being educated with boys in all the high schools of the West, and not to admit them to the State universities would have been to break with tradition. Women were also firmly established as teachers in the secondary schools, and it was patent to all thoughtful men that they must be given opportunities for higher education, if only for the sake of the secondary education of the boys of the country. The development of women's education in the East has followed a different course because there were in the East no State universities, and the private colleges for men

had been founded before women were suffered to become either pupils or teachers in schools. The admission of women to the existing eastern colleges was, therefore, as much an innovation, as it would have been in Europe. The coeducation of men and women in colleges, and at the same time the college education of women, began in Ohio, the earliest settled of the western States. In 1833 Oberlin Collegiate Institute (not chartered as a college until 1850) was opened, admitting from the first both men and women. It was the first institution for collegiate instruction in the United States where large numbers of men and women were educated together, and the uniformly favorable testimony of its faculty had great influence on the side of coeducation. In 1853 Antioch College, also in Ohio, was opened, and admitted from the beginning men and women on equal terms. From this time on it became a custom, as State universities were opened in the far West, to admit women. Utah, opened in 1850; Iowa, opened in 1856; Washington, opened in 1862; Kansas, opened in 1866; Minnesota, opened in 1868; and Nebraska, opened in 1871, were coeducational from the outset. Indiana, opened as early as 1820, admitted women in 1868. The University of Michigan was, at this time, the most important western university, and the only western university well known in the East before the War. When, in 1870, it opened its doors to women, they were for the first time in America admitted to instruction of true college grade. The step was taken in response to public sentiment, as shown by two requests of the State legislature, against the will of the faculty as a whole. The example of the University of Michigan was quickly followed by all the other State universities of the West. In the same year women were allowed to enter the State universities of Illinois and California; in 1873 the only remaining State university closed to women, that of Ohio, admitted them. Wisconsin which, since 1860, had given some instruction to women, became in 1874 unreservedly coeducational. All the State universities of the West, organized since 1871, have admitted women from the first. In the 20 States which, for convenience, are classified as western, there are now 20 State universities open to women, and, in four Territories—Arizona, Oklahoma, Indian, and New Mexico—the one university of each Territory is open to women. Of the 11 State universities of the southern States the two most western admitted women first, as was to be expected. Missouri became coeducational as early as 1870, and the University of Texas was opened in 1883 as a coeducational institution. Mississippi admitted women in 1882; Kentucky in 1889; Alabama in 1893; South Carolina in 1894; North Carolina in 1897, but only to women prepared to enter the junior and senior years; West Virginia in 1897. The State universities of Virginia, Georgia, and Louisiana are still closed to women. The one State university existing outside the West and South, that of Maine, admitted women in 1872.

The greater part of the college education of the United States, however, is carried on in private, not in State universities. In 1897 over 70 per cent of all the college students in the United States were studying in private colleges, so that for women's higher education their admission to private colleges is really a matter of much

COEDUCATION

greater importance. The part taken by Cornell University in New York State in opening private colleges to women was as significant as the part taken by Michigan in opening State universities. Cornell is in a restricted sense a State university, inasmuch as part of its endowment, like that of the State universities, is derived from State and national funds. Nevertheless, there is little reason to suppose that Cornell would have admitted women had it not been for the generosity of Henry W. Sage, who offered to build and endow a large hall of residence for women at Cornell University. After carefully investigating coeducation in all the institutions where it then existed, and especially in Michigan, the trustees of the university admitted women in 1872. The example set by Cornell was followed very slowly by the other private colleges of the New England and Middle States. In Massachusetts Boston University opened its department of arts in 1873, and admitted women to it from the first; but no college for men followed the example of Boston until 1883, when the Massachusetts Institute of Technology admitted women. This school, like Cornell, is supported in part from State and national funds. In 1892 Tufts College was opened to women. In the West and South the case is different, and the list of private colleges that one after another have become coeducational is too long to be inserted here. Among new coeducational foundations the most important are, on the Pacific coast, the Leland Stanford Junior University, opened in 1891; and in the middle West, Chicago University, opened in 1892. (For Chicago's recent attitude, see UNIVERSITY OF CHICAGO.)

Of the 480 colleges for men enumerated by the commissioner of education, 336, or 70 per cent (or, excluding Catholic colleges, 80 per cent) admit women. In the western States there are, excluding Roman Catholic colleges and seminaries, out of 195 colleges 182 coeducational, and only 13 colleges for men alone. In the southern States and southern middle States, excluding Roman Catholic colleges and seminaries, out of 161, there are 125 coeducational and but 36 colleges for men only. Among these 36, however, are some of the most important educational institutions in that section—Johns Hopkins University, the University of Georgia, the Louisiana State University, Tulane University, and the University of Virginia. In New England and the northern middle States, out of 64 colleges, excluding Roman Catholic colleges and seminaries, only 29, or less than half, are coeducational. The colleges for men only include (with the exception of Cornell) all the largest undergraduate colleges in this section—Harvard, Yale, Columbia, Princeton, Pennsylvania.

Five important universities, closed to women in their undergraduate departments, have each affiliated to them a women's college through which women obtain some share in the undergraduate instruction given, the most important being Harvard, Columbia, and Western Reserve University. Of these five, four (all but Harvard) admit women without restriction to their graduate instruction, and in addition Yale, the University of Pennsylvania, and New York University make no distinction between men and women in graduate instruction. The Johns Hopkins University maintains a coeducational medical school. Princeton is the only one of the large university foundations that excludes

women from any share whatsoever in its advantages.

All the arguments against the coeducation of the sexes in colleges have been met and answered by experience. It was feared at first that coeducation would lower the standard of scholarship on account of the supposed inferior quality of women's minds. The unanimous experience in coeducational colleges goes to show that the average standing of women is slightly higher than the average standing of men. Many reasons for the greater success of women are given, but the fact, however it be explained, remains and is as gratifying as astonishing to those interested in women's education. The question of health has also been finally disposed of; thousands of women have been working side by side with men in coeducational institutions for the past 25 years and undergoing exactly the same tests without a larger percentage of withdrawals on account of illness than men. The question of conduct has also been disposed of. None of the difficulties have arisen that were feared from the association of men and women of marriageable age. Looking at coeducation as a whole, it is most surprising that it has worked so well. Not only is the number of coeducational colleges increasing, but the number of women relatively to the number of men is increasing also. Between 1890 and 1898 men in coeducational colleges increased 70.0 per cent, but women in coeducational colleges increased 105.4 per cent. There is every reason to suppose that this increase of women will continue. Already girls form 56.5 per cent of the pupils in all secondary schools; and 13 per cent of the girls enrolled and only 10 per cent of the boys enrolled graduate from the public high schools. It is sometimes said that men students, as a rule, dislike the presence of women, but statistics show that the number of men increases more rapidly in coeducational colleges than in colleges for men only. It is women who have shown a preference for separate education; women have increased more rapidly in separate colleges for women than in coeducational colleges. It will be observed, however, that the separate colleges for women, like the separate colleges for men, are in the East; it is in the East only that any preference for separate education is shown by either sex. This preference is natural, since college life as it is organized in a woman's college seems to conservative parents less exposed, more in accordance with inherited traditions; and girls, who in their own homes lead guarded lives, are to be found in women's colleges rather than in coeducational colleges. Then, too, for the present, much of the culture and many of the priceless associations of college life are to be obtained, whether for men or women, only by residence in college halls, and no coeducational, or even affiliated, colleges have as yet organized for their students such a complete college life as the independent woman's college. In professional schools, including the graduate school of the faculty of philosophy, coeducation is even at present almost the only method. There are in the United States only four graduate schools for men closed to women, and only one independent graduate school maintained for women offering three years' consecutive work leading to the degree of Ph.D.

M. CAREY THOMAS,
President of Bryn Mawr College.

COEFFICIENT OF EXPANSION — CŒLEENTERATA

Coefficient of Expansion. See GAS; HEAT; THERMOMETER; THERMOMETRY.

Coefficient of Friction. See FRICTION.

Coefficient of Induction. See ELECTRICITY; INDUCTION.

Coehorn, koo'hörn, **Menno**, BARON VAN, Dutch engineer: b. near Leeuwarden, Friesland, 1641; d. The Hague 17 March 1704. In his 16th year he entered the service as captain, and soon rose to the rank of a colonel. During the siege of Graves he made use for the first time of the small mortars, called in honor of their inventor *coehorns*, used for throwing grenades. In the war of 1689, against France, he again distinguished himself. His defense of Fort William, in 1692, which he himself had planned, against the attacks of Vauban, attracted much attention. Both commanders displayed all their talents. In 1702 he published at Leeuwarden his new theory of fortification. In 1703 he directed several sieges. He fortified almost all the strong places in Holland. Bergen-op-Zoom he considered his masterwork. His system, and that of Vauban, are entirely different. Vauban operated by manœuvres, and by the skilful direction of his ordnance and his men saved both, and wearied and divided the forces of the enemy; Coehorn crushed by an overpowering mass of artillery and men, and sacrificed both for a rapid and powerful effect.

Cœle-Syria, sē'lē-sīr'ī-ā ("Hollow Syria"), the ancient name of the large valley lying between the Lebanon and Anti-Lebanon mountain ranges in Syria. The valley is about 100 miles in length. Near its centre are the ruins of Baalbek, or Heliopolis, and near the ruins rise the rivers Orontes and Litany, which water and fertilize the plain. The name also at one time included all the country (except Judea and Phœnicia) extending from Seleucis to the confines of Egypt and Arabia.

Cœlebs (sē'lēbz) in **Search of a Wife**, a moral tale by Hannah More, published 1808. This is the best-known work of fiction by that prolific moralist. It was written after she had passed her 60th year, and was intended as an antidote to what she considered the deleterious influence of the romantic tales of that day. In 'Cœlebs' she sought to convey precepts of religion, morals, and manners, in the form of a novel. The book had an instant and great popularity. The first edition was sold in a fortnight, and 11 within a year. Its republication in the United States was also highly successful.

Cœlenterata, sē-lēn-tē-rā'ta. The zoophytes or radiate animals of older writers included, among others, the *Actinia* or sea-anemone, the coral, the fresh-water *Hydra*, the sea-firs (*Sertularia*), and the *Medusidæ* or jelly-fishes. These forms were united under the common designation *Cœlenterata* by Frey and Leuckart, and recent observations tend to include the sponges likewise in the same class. Omitting the sponges, however, as their relations are still uncertain, the *Cœlenterata* may be defined as animals whose body wall, consisting of two layers, ectoderm and endoderm, encloses a cavity which has only one external aperture, and which discharges the function at once of digestive and circulatory organ. The outer sur-

face may secrete a horny sheath, as in the sea-firs, or may develop in its substance the hard calcareous skeleton of the corals. The *Hydra*, if divided transversely at any point, shows only a single circular boundary; but the *Actinia*, if similarly treated, is seen to consist of an external and an internal circle, between which radial partitions pass. This is due to the fact that the oral margins are prolonged inward for a short distance as a funnel, which terminates by a truncated open end: the matters received into the funnel and then digested circulate in the compartments outside the funnel, while the effete portions are rejected by the mouth. The *Hydra* and *Actinia*, which are the simplest representatives of the two principal divisions of the class, are at first sight alike in their perfect radial arrangement; but in the *Actinia* bilateral symmetry may be recognized, in so far as the presence of a tubercle within the tentacular circle indicates the point through which a section would divide equally the cylindrical animal. The structure of the coral will be given under that heading. The Venus' girdle (*Cestum veneris*), the spherical *Cydippe*, and the *Beroë*, are the commonest members of the *Ctenophora*, whose locomotive organs consist of cilia arranged on definite bands which divide the surface. The *Hydrozoa* comprise a very varied assemblage of fixed or free-swimming forms, of single animals or clusters aggregated into a compound mass by a process of gemmation, the various members of the group giving off buds which remain in organic connection with the parent mass. This, the simplest mode of multiplication, is obviously asexual, and the development of ova may take place at some part of the compound mass. But the most interesting phenomena are presented by those forms which illustrate what is known as alternate generations, when from the egg is produced an organism which is unlike that which gave it birth, but whose progeny exactly repeats the form whence the egg was derived. Thus from the egg may be produced a fixed compound structure like the sea-fir, from which a free-swimming zoöid is given off; and in this an egg is produced whence the fixed form is again developed. These free-swimming zoöids are the familiar umbrella-like disks of our jelly-fishes, and these are either gymnophthalmous, or naked-eyed, the eye-spots on the margin of the disk being exposed; or else these spots are covered by a fold of the body-wall, as in the covered-eyed or steganophthalmous *Medusæ*. These free-swimming forms move by the contraction of their umbrella; but the airsacs developed in the Portuguese man-of-war and the like assist or supersede the muscular action of the disks. The majority of these *Medusæ* are known to be merely the sexual phases in the alternate generations, and the difficulty of their determination may be guessed from the fact, that the one "generation" may consist of zoöids seven feet in circumference, while that from which they proceeded is only half an inch in height. The researches of Allman have shown a beautiful series of gradations connecting the apparently quite dissimilar members of the group. Thus the umbrella-like zoöids may remain in connection with the parent mass of which they are buds, and the free-swimming zoöids are shown to be merely detached reproductive organs.

CÆLIAC ARTERY — COFFEE

Cœliac Artery, an artery issuing from the aorta just below the diaphragm. It is called also the cœliac axis.

Cœlost, sē'lō-stāt, an astronomical instrument in which an image of the sky is shown reflected in a plane mirror. Such an instrument was completed in 1903 for the Smithsonian Institution at Washington. It will be used primarily for the study of solar phenomena.

Cœnogenesis. See RECAPITULATION.

Cœphori. See ÆSCHYLUS.

Coercion Acts. See IRELAND.

Coethen, kē'tĕn, Germany, a town in the duchy of Anhalt, in a fertile and attractive district on the Ziethe, about 80 miles southwest of Berlin. It was, till 1853, the capital of the former duchy of Anhalt-Cœthen. It consists of the old and the new town and several suburbs; has a fine Protestant cathedral church in the Gothic style, with old glass-paintings and a fine organ; the former ducal residence with library, picture-gallery and museum; a gymnasium, normal and several other schools. There are manufactures of machinery and metal goods, and various other industries. Beet-sugar is a staple article of commerce. The town dates back to the 10th century. Pop. 23,000.

Cœur, Jacques, zhāk kēr, French merchant and royal treasurer: b. Bourges toward the end of the 14th century; d. Chios, in the island of Scio, 25 Nov. 1456. His vast commercial enterprise attracted the attention of Charles VII., who in 1435 appointed him master of the French mint, and afterward treasurer. His excellent management of affairs caused the king to ennoble him, and to intrust him with high functions in the French provinces, and diplomatic missions in Italy. Cœur contributed 200,000 crowns to help the king in rescuing Normandy from the English. After the successful end of the war, his influence became so great as to give offense to envious persons, who after the death of the king's mistress, Agnes Sorel, charged him with having poisoned her, and caused him to be arrested (1451), and his vast property to be confiscated. Although the charge was proved to be groundless, he was detained in prison until 1455, when he effected his escape. Repairing to Rome, he was kindly received by Pope Nicholas V., and was enabled to gather the broken remains of his fortune. He had vainly claimed the clemency of Charles VII. in favor of his family, and it was under Louis XI. only that his memory was exculpated from all charges, while a part of his property was afterward restored to his descendants.

Cœur d'Alêne, kēr dā-lān (Fr. "awl-heart"). 1. A name given by the French *voyageurs*, traditionally from the stinginess of a chief, to a tribe of Indians of the Salishan stock, though with a dialect widely different from the other members. Their own name is Skitswish, which Lewis and Clarke rendered Skitzoomish. When found by Lewis and Clarke they occupied a considerable tract in northern Idaho and Washington, near the lake named after them. There were perhaps 2,000 of them, rather squalid and unadventurous, though cruel; they lived on roots, fish, and small game, and did not visit the buffalo grounds. Father de Smet visited them in 1841, and the next year a Catholic mission was established among them,

and they became Christians. They had regular dwellings and a mill; but they were hostile to the encroaching whites, and in 1858 their chief, Vincent, with a band of his warriors, joined in a war on them, which was only put down by Gen. Wright after two sharp battles, at Four Lakes and Spokane Plains. In 1867 part of them were placed on a reservation in Idaho, and in 1872 the rest were removed to the Colville Reservation, between the Okanogan and Columbia rivers.

2. A lake in northern Idaho, situated among mountains of the same name. The rivers Cœur d'Alêne and St. Joseph flow into the lake at its southern end, and the Spokane River is its outlet at the north. The region is a mining district, and has been the scene of serious labor troubles, especially in 1892 and 1899.

Cœur d'Alêne, a novel by Mary Hallock Foote, published 1894. It is a story of the Colorado mining camps, full of realistic details. Its situations turn upon the labor strife between union and non-union miners in 1892, which forms the sombre background of a bright lovers' comedy.

Cœur de Lion, kēr dē lē-ôn, a title given to several historical personages, as Richard I. of England; so called from the prodigies of personal valor performed by him in the Holy Land; Louis VIII. of France, frequently called *Le Lion*; and Bolaslus I. of Poland, also called "The Intrepid."

Coffee, the seed of an evergreen shrub, which is cultivated in tropical countries, supposed to be native to Abyssinia, although it was early found in Arabia. The plant belongs to the genus *Coffea*, order *Rubiaceæ*. In the wild state it grows to a height of from 6 to 30 feet, but in cultivation it is pruned and kept between 6 and 10 feet. The leaves are green, glossy on the upper side, and somewhat resemble those of the laurel, but less dry and thick. The flowers are white, fragrant, and grow in clusters from the axils of the branches. The fruit, often called berries, grows in clusters of from 3 to 12, each with a short stem or sessile. The fruit when ripe resembles in appearance a dark-red cherry, or a medium-sized cranberry. Each berry contains two seeds embedded in a yellowish, sweetish pulp which, when ripe, is delicious.

The trees are raised from seed grown in nurseries, and when of a size to endure variations of temperature, usually in about six months' time, they are transplanted to the coffee orchard. They begin to bear when three years old, and yield fruit for about 20 years. Considerable space is left between the trees, and corn, bananas, and plantain are grown among them, especially when young. The first year's crop is small, but when in full bearing a tree will yield from one to five pounds, according to location and variety. The regions best adapted to the growth of coffee are between the parallels of 15° north and 15° south latitude, and from 1,000 to 4,000 feet above sea-level. It is cultivated from lat. 25° N. to 30° S., in places where the temperature does not fall below 55° F. Moist and somewhat shady slopes are found most desirable. Little streams of water are conducted to the roots of the trees, which are kept very wet until the fruit is nearly ripe, then the water is turned off to keep the fruit from becoming too succulent. The fruit varies in size and color

COFFEE

according to the altitude in which it grows; that from highlands is small and green; that grown on lowland and near the coast is larger and of a yellowish tinge. The wild trees of Liberia, which grow in the lowlands, produce the largest fruit known, but it is of inferior quality. The coffee from the Far East can be distinguished by its large bean of a yellow color, while that of Central and South America is smaller and of greenish color. The fruit is harvested with great care, cloths being placed under the trees before shaking them. The fruit is then exposed to the sun to dry, after which it is pulped, washed, dried again, hulled, cleaned, and sorted before it is ready for the market. In some places, especially Brazil, the bean is pulped by machinery as soon as it is taken from the tree, and thus the time necessary to get the coffee ready for market is shortened.

Some of the coffee-producing countries of the world to-day are: Brazil, the Philippines, Hawaii, Cuba, Porto Rico, Jamaica, Central America, and parts of Africa, Arabia, Java, and Ceylon. Brazil has a larger coffee-bearing area than any other country; it produces more than two thirds of all the coffee consumed in the world. One year, when the crop was unusually good, Brazil produced 660,000 tons, and that same year the world's consumption was 600,000 tons. Coffee planting in Brazil has been the most successful farming in the world. Sao Paulo, a city of 250,000, owes its existence to the trade in the coffee raised in the great orchards in the vicinity. In some of the orchards there are about 5,000,000 trees. Large quantities of the Brazilian coffee are shipped annually to Aden (Arabia) and reshipped to other parts of the world as mocha. The producing of coffee in Yemen, or Wady Negram, or anywhere near Mocha is a thing of the past; but one kind of coffee-berry raised in Brazil and in some other countries much resembles in form and flavor the old market mocha. Coffee planting is no longer pursued to any extent in Ceylon. The red lands in the province of Sao Paulo, in Brazil, seem to be particularly favorable to the growth of the tree, and this section seems immune to the leaf disease which has destroyed the industry in Ceylon and in some parts of the West Indies. Giving the soil a rest or changing crops may result in again placing Ceylon among the places producing an excellent quality of coffee. The names given to coffee are usually those of the cities from which shipments are made.

The difference in taste of coffee as found in our markets is principally due to two causes: (1) the roasting to either a reddish-brown or a dark brown; (2) the picking of coffee when some berries are green, others red, and still others a dark purple, the last being the ripe fruit. Thus we have three grades from each tree; add the difference in roasting, as mentioned, and we have six grades; then take the perfect berry, which is flattened on one side, and the spherical berry, the so-called mocha, and that gives 12 grades of coffee.

In Porto Rico and Cuba coffee of a good quality is raised, but as yet in small quantities. In the Hawaiian Islands coffee of excellent quality is produced, and the orchards are increasing in size and number. Hawaiian coffee brings the highest price of any on the Pacific coast. In the Philippines there are splendid orchards, espe-

cially in the southern islands of the archipelago, known as the Sulu or Jolo group. On the island of Jolo are fine coffee-trees that bear much earlier after planting than those of Brazil. There are large tracts of land in the Philippines which are as favorable for coffee growing as any in Brazil, but the area that may be devoted to coffee farming is not so great.

The United States leads the world in the consumption of coffee. The yearly consumption in Great Britain declined steadily during the last half of the 19th century. This is attributed to the adulterations which at one time were extensively practised. Probably few articles of food are subjected to so much adulteration as coffee. Substances of an entirely foreign nature are often palmed off as genuine coffee, or are offered as substitutes. Dandelion, parsnip, carrot, and beet roots, beans, lupins, rice, and various cereals, roasted and ground, have all been employed, and within recent years the manufacture of artificial coffee has been undertaken on a considerable scale, the material being mixed to a stiff paste and run through a machine for which patents have been granted, and from which it emerges in the shape of "coffee-beans," which, after drying and roasting, are well calculated to deceive the eye, though not the nostrils or palate. These adulterations can be readily detected, for genuine roasted coffee may be soaked in cold water indefinitely without the bean losing its smooth surface or hard, tough consistency, nor will it impart its color to the water; whereas chicory and other imitations become soft and spongy and render the water muddy. As far back as the eighties it was estimated that something like 18,000,000 pounds of various vegetable substances were annually sold as coffee.

In Medicine.—Many of the leading medical men of the day hold that the action of coffee on the body is due to two or three factors. If coffee is mixed with milk or cream, it gives a certain amount of nutritive matter; but its action is usually that due to the volatile oils, and to the caffeine contained. The volatile oil, like others in this class, stimulates peristalsis, and assists to overcome constipation—in this respect coffee and tea being quite opposites—and it also aids in the expelling of flatus; but taken too often and in too large quantities the oil contributes to the causation of a certain amount of gastric indigestion. The more delicate the aroma of coffee the less the oil, and the better from this standpoint. The action of caffeine is much more complex.

So far as coffee-drinking is concerned, the action of caffeine is that of a cardiac stimulant, a nerve-muscle excitant, a diuretic, and a cerebral excitant. Thus it may cause a sense of undue fullness in the blood vessels. It almost invariably causes a slight muscular tremor, which is not noted in those who do not use their hands for fine work, as artists, for example. It causes an increased flow of urine, and tends to prevent sleep. Time, custom, usage, dose, and the individual's reaction all modify these general laws; but these reactions occur, although none of them may be of sufficient grade to make the observer cognizant of the action. Thus many people are not kept awake by coffee. They have probably habituated themselves and require larger doses.

Hot coffee is one of the best heart tonics known, and it is sometimes used in large quan-

COFFEE-BUG — COFFIN

tities by rectum in cases of shock, opium poisoning, pneumonia, etc. Coffee is also valuable in many types of headache and in many cases of nausea. Its excessive use leads to great muscular irritability, gastritis, restlessness, and sleeplessness. It is held by many medical men that the effects of coffee as a beverage are wholly bad. They say that the caffeine in the coffee, or in other vegetable substances—tea, coffee, kola, guarana, and maté, or Paraguay tea—is a stimulant to the brain, nerves, heart, and kidneys. In small doses it helps to resist fatigue, increases mental power and promotes excretion of urine. Large doses or continued use, however, tend to make a person nervous, to induce irritability of the heart with considerable depression, and to upset the stomach. The mildest results of an overdose are a tendency to wakefulness, but there are recorded a number of deaths from heart-failure due to its employment in large doses. It is used largely as a heart-stimulant and diuretic, but its action is characterized by great variability. Individual susceptibility to it varies so greatly that what would be a poisonous dose for one person would scarcely affect another. The usual dose is half a grain to three grains.

History.—The early history of coffee is obscure; as an article of diet, its introduction is recent; to the Greeks and Romans it was wholly unknown. It was first introduced into Persia from Abyssinia, and next in the 15th century by a Mohammedan priest at Aden. From Aden it was carried to Mecca, where first the pilgrims or Hadjis, and then the rest of the people, began to use it. From Arabia it was taken to Cairo, Egypt, where in 1511 it was prohibited because it was believed to be an intoxicant and came within the class of things forbidden as food by the Koran. The Sultan Causon removed the prohibition, and coffee passed along the coast by way of Syria and around to Constantinople. Again it was opposed as one of the articles not to be used as food according to the Koran. Thus its use was permitted and allowed for many years. The Turks are now immoderate coffee-drinkers.

Prior to the 18th century all the coffee used in Europe was brought from Arabia Felix via the Levant. In 1652 Edward, a merchant, in trade with Turkey, introduced coffee into England; in 1697 Van Horn introduced it into Batavia, and from there it was taken to France and the West India Islands. In 1754 Father Villaso, a Franciscan monk, took a plant to Rio Janeiro and cultivated it in the garden of the monastery of St. Anthony. This one plant was the means of introducing coffee into Brazil.

Bibliography.—Cook, 'Shade in Coffee Culture' (United States Botany Division, Bulletin 25); Hangwitz, 'The World's Coffee Trade in 1898' (United States Consular Reports, Vol. LX. 258); Hewitt, 'Coffee, Its History, Cultivation, and Uses'; Lock, 'Coffee, Its Culture and Commerce in all Countries'; Caswell, 'Coffee Culture in Our New Islands,' in the 'Overland Monthly,' new series Vol. XXXII. 459; and United States Bureau of American Republics, 'Special Report on Coffee Culture in Central and South America.'

Coffee-bug, an insect (*Lecanium coffeæ*), of the *Coccus* family (*Coccidæ*), very destructive in coffee plantations.

Coffee House, a house of entertainment where persons are supplied with coffee and other refreshments. Such houses were formerly the chief resorts of every class for purposes of conversation and information, and the meeting-places of politicians, literary men, etc. Constantinople is believed to have been the first European capital in which coffee-houses were instituted, the year of their establishment there being 1554 A.D. In 1650 the first one in England was opened in Oxford. They were suppressed by Charles II. in 1675, but were soon allowed to be reopened.

Coffee-nut: Coffee-tree. See Kentucky Coffee-tree.

Coffer-dam, a water-tight enclosure round a space where it is intended to found the pier of a bridge, quay, etc., so constructed that the water may be pumped out of it and the masonry executed "in the dry." It is formed of one or more rows of piles (usually two), between which clay is rammed. The piles, generally driven close together, are sometimes grooved and tongued; but if the water be not very deep the piles are placed some distance apart, and boards let into the grooves. Of course great care must be taken that no water can enter at the joints or at the junction with the natural soil, and that the structure is sufficiently strong to resist the great pressure of water from without. If the bottom is of rock, and piles cannot be driven, coffer-dams may be formed of two parallel stone walls, the intervening space filled up with clay. Iron caissons are also used instead.

Coffer Fish, or **Trunk Fish**, a peculiar genus (*Ostracion*) of bony fishes in the small order *Plectognathi*, and in the suborder *Sclerodermi*, which also includes the file-fishes. The body is enclosed in a firm box formed of hexagonal bony scales fitted into one another like a mosaic. The snout, the bases of the fins, and the end of the tail are the only soft-skinned parts. Over a score of species are known from tropical and sub-tropical seas. The best-known form is *O. quadricornis* from the tropical Atlantic.

Cof'feyville, Kan., a city of Montgomery County, situated on the Verdigris River, and on the Missouri P., Atchison, T. & S. F., and other railroads. There are gas wells in the vicinity, and the city has a large trade with Indian Territory, and a number of manufacturing interests. Pop. (1900) 4,953.

Coffin, Charles Carleton, American novelist and lecturer: b. Boscawen, N. H., 26 July 1823; d. Brookline 2 March 1896. He began life as a civil engineer, and afterward gave his attention to telegraphy. In 1851 he began to write for the Boston papers; and during the Civil War and the Austro-Prussian war of 1866 was war correspondent for the *Boston Journal*, writing over the signature of "CARLETON." His books include: 'Days and Nights on the Battlefield' (1864); 'Four Years of Fighting' (1866); 'Our New Way Round the World' (1869); 'Story of Liberty' (1878); 'Boys of '76' (1879); 'Old Times in the Colonies' (1880); 'Life of Garfield' (1883); 'The Drum-Beat of the Nation' (1887); 'Marching to Victory' (1888); 'Freedom Triumphant' (1891).

Coffin, Sir Isaac, English admiral: b. Boston, Mass., 16 May 1759; d. England 23 July 1839. He entered the English navy as midshipman in 1773, served on various ships on the

COFFIN

American station, in 1778 was appointed lieutenant, and in 1781 commander. On 16 March 1781 he acted as signal-lieutenant to Admiral Arbuthnot in the action off Cape Henry, and in 1782 was present as a volunteer under Admiral Hood in the engagement between Rodney and De Grasse. In 1798, when Minorca fell into the hands of the English, he was appointed superintendent of the arsenal at Port Mahon. In 1804 he was advanced to the rank of rear admiral of the blue; next year was made a baronet; in 1808 vice-admiral, and in 1814 admiral. In 1826 he founded a school in Nantucket, Mass., still called by his name.

Coffin, James Henry, American scientist: b. Williamsburg, Mass., 6 Sept. 1806; d. Easton, Pa., 6 Feb. 1873. He was graduated at Amherst, 1828. He taught at Greenfield, Mass., Ogdensburg, N. Y., 1829-40; at Williams College 1840-3; Norwalk (Conn.) Academy 1843-6, when he was elected professor of mathematics and astronomy in Lafayette College, Easton, Pa., where he remained till his death. His reputation is due to his achievements in meteorology, a subject he began to investigate as early as 1838. In 1853 he published his theory of atmospheric circulation, including the principle quoted in Europe since 1860 as 'Buys-Ballot's Law.' He wrote: 'Solar and Lunar Eclipses' (1845); 'Winds of the Northern Hemisphere' (1853); 'Psychrometrical Tables' (1856); 'The Orbit and Phenomena of a Meteoric Fire-Ball, 20 July 1860' (1869); 'Elements of Conic Sections' (1874); 'The Winds of the Globe; or, the Laws of Atmospheric Circulation over the Surface of the Earth' (1875), completed by his son, S. J. Coffin. See Clyde, 'Life of J. H. Coffin' (1882).

Coffin, John Huntington Crane, American mathematician: b. Wiscasset, Maine, 14 Sept. 1815; d. Washington, D. C., 8 Jan. 1890. He was graduated at Bowdoin 1834, and in January 1836 entered the United States navy as professor of mathematics, serving in the West India squadron, and at the Norfolk navy yard. He had charge of the mural circle in the Naval Observatory at Washington from 1843 to 1853, when he was transferred to the Annapolis Naval Academy, taking charge of the department of mathematics, and later astronomy and navigation. From 1865 to 1877 he had charge of the 'American Ephemeris and Nautical Almanac.' In 1877 he was placed on the retired list. Bowdoin conferred the degree of LL.D. upon him in 1884, and in 1863 he became one of the corporate members of the National Academy of Sciences, named by Act of Congress. He published 'Observations with the Mural Circle, with Formulas, Tables, and Discussions, 1845-9', published in the observatory volumes for those years; 'The Compass' (1863); 'Navigation and Nautical Astronomy' (1868); 'Observations of the Total Eclipse of the Sun, August 1869' (1884).

Coffin, Joshua, American antiquary: b. Newbury, Mass., 12 Oct. 1792; d. there 24 June 1864. He was graduated at Dartmouth College in 1817, and was a teacher for many years. Whittier was one of his pupils, and addressed to him the poem 'To My Old School-Master.' Coffin was an ardent abolitionist, being a founder and first recording secretary of the New England Anti-Slavery Society 1832. He compiled:

'Sketch of the History of Newbury, Newburyport, and West Newbury, 1635-1845' (1845); 'List of Some of the Descendants of Mr. E. Woodman (of) Newbury, Mass., 1635' (1855); 'The Toppans of Toppan's Lane: Their Descendants and Relations' (1862).

Coffin, Levi, American philanthropist: b. near New Garden, N. C., 28 Oct. 1798; d. Avondale, Ohio, 16 Sept. 1877. He was a farmer's son, and early evinced interest in the negro's welfare. Proving successful in business, he actively aided slaves to gain freedom, largely through the "underground railroad." Thousands of escaping slaves were aided on their way to Canada by him. He helped found the Freedman's Bureau in 1863, and after the Civil War was active in schemes to advance the welfare of the colored people. He was known popularly as "President of the Underground Railroad."

Coffin, Robert Barry, American journalist and miscellaneous writer: b. Hudson, N. Y., 21 July 1826; d. Fordham, N. Y., 10 June 1886. He was on the staff of the 'Home Journal' of New York (1858), and was also art critic of the *Evening Post*. His humorous sketches, which appeared in many periodicals over the pen-name "BARRY GRAY," have been extensively read. Among his publications are: 'My Married Life at Hillside' (1865); 'Cakes and Ale at Woodbine' (1868); and 'The Home of Cooper' (1872).

Coffin, Robert Stevenson, American printer and poet: b. Brunswick, Maine, 1797; d. Rowley, Mass., 7 May 1827. He served his apprenticeship as a printer in Newburyport; was a sailor during the War of 1812, and at one time a prisoner on board a British frigate, and subsequently worked on newspapers in Boston, New York, and Philadelphia, publishing occasional verses in the poet's corner. He came to be known, perhaps from his own pretentiousness, as "The Boston Bard," and his poems were collected in a volume entitled the 'Oriental Harp, Poems of the Boston Bard.'

Coffin, William Anderson, American painter: b. Allegheny, Pa., 31 Jan. 1855. He was graduated at Yale 1874, studied art in the United States 1874-7, and then in Paris under Leon Bonnat 1877-82. He opened a studio in New York 1882, and has become well known as a painter of landscapes and figure pieces. In 1886 he won the Hallgarten prize of \$200; was awarded a medal at the Paris Exposition 1889; received the Webb prize of the Society of American Artists 1891; and was gold medallist of the Philadelphia Art Club 1898. He was art critic of the New York *Evening Post* 1886-91, and of the New York *Sun* 1896-1900. In 1901 he was director of fine arts at the Pan-American Exposition in Buffalo, N. Y. Among his best-known pictures are: 'The Rain,' in the Metropolitan Museum; 'Une académie de peinture moderne'; 'An Examination' (time of Louis XIII.); 'The Close of Day' (1881); 'The Hayfield' (1886).

Cof'fin, a box or case designed to hold a corpse for interment or cremation. Coffins were used by the ancients mostly to receive the bodies of persons of some distinction. Among the Romans it was latterly the almost universal custom to consume the bodies with fire, and deposit the ashes in urns. Even at the present time coffins are not used in the East, either by

Mohammedans or Christians. In Egypt coffins seem to have been used in ancient times universally. They were of stone, earthenware, glass, wood, or a kind of pasteboard made by gluing cloth together. (See SARCOPHAGUS.) Coffins among Christians were probably introduced with the custom of burying. (See BURYING-PLACES.) It has been often proposed that they should be made with a hole opposite the place of the mouth of the body, so as to allow breathing in case of revival. Of course it would be necessary, at the same time, to let the coffin stand for some days in a convenient place, as is the custom in some parts of Germany. It has recently been proposed to employ coffins of wicker-work, while some strenuously advocate the burning of all dead bodies. See CREMATION.

Cofre de Perote, kō'frā dā pā-rō'tā, Mexico, a mountain about one mile from the town of Perote, and 70 miles northwest of Vera Cruz. It is 13,414 feet high. The English name is the Four Parts, or the Square Mountain. It is formed of basaltic porphyry.

Cog-wheel, a wheel with cogs or teeth. The pitch of such a wheel is the distance, measured along the pitch-line (explained below), between the centres of two successive teeth. The pitch-surface is an imaginary smooth surface between the tops and bottoms of the teeth, which is such that the velocity-ratio which would be produced by rolling contact with the pitch-surface of another toothed wheel would be the same as that actually produced by the action of the cogs. The pitch-circle (or pitch-line) of circular wheels is a section of the pitch-surface made by a plane perpendicular to the surface and to the axis of the wheel. The distance from the centre of the wheel to the pitch-line is the primitive radius, that from the centre to the crest of the cog being the true radius. The face of a cog is its outer surface, and the space between two adjacent teeth is the interdental space. Various kinds of toothed wheels are in use, such as the spur-wheel, the crown-wheel, and the bevel-wheel.

Coggeshall, England, a town in the county of Essex, 42 miles northeast of London, on the left bank of the Blackwater. The place was once famous for the manufacture of a kind of baize, celebrated under the name of "Coggeshall whites." The hamlet of Little Coggeshall is on the opposite side of the Blackwater, which is crossed here by an ancient bridge of three arches, said to have been built by King Stephen, who founded here also an abbey for Cistercians.

Coghetti, Francesco, frän-chës'kō kō-gët'tē, Italian painter: b. Bergamo 4 Oct. 1804; d. Rome 21 April 1875. He was a profound student of Raphael and is best known by his masterly frescoes in the basilican church at Savona. He adorned several Roman palaces with frescoes, and was knighted for his 'Condemnation of Saint Stephen.'

Coghlan, kög'lan, Charles Francis, American actor: b. Paris, France, 1841; d. Galveston, Texas, 27 Nov. 1899. He was educated for the bar in London, but went on the stage, making his American début in 1880 as Captain Absolute in 'The Rivals.' He took leading parts for many years, being a refined and capable impersonator of old school gentlemen. He wrote: 'Jocelyn'; 'Lady Barter'; and other plays.

Coghlan, Joseph Bullock, American naval officer: b. Frankfort, Ky., 8 Dec. 1844. Graduated in 1863 from the United States Military Academy, he at once saw service as ensign in the Civil War, in 1868 rose to be lieutenant-commander, and later served successively on board the Richmond, Saugus, Monongahela, and Indiana. In 1882 he was promoted commander, and in 1896 captain. As commander of the Raleigh of the Asiatic station from 1897, he took part in the battle of Manila Bay, 1 May 1898. On 2-3 May he commanded expeditions for the reduction of all Spanish batteries at the mouth of the bay, and on 7 July an expedition for the capture of Isla Grande, Subig Bay, Luzon. He was commissioned rear-admiral in 1902 and appointed to command the Caribbean squadron of the North Atlantic fleet.

Coghlan, Rose, American actress: b. Peterborough, Eng., 1853. She rose from humble roles in England to be leading lady, making her American début in 1872. From 1880 to 1889 she was Wallack's leading lady and since 1893 has "starred" in various American and English companies.

Cognac, kōn-yäk, France, in the department of Charente, on the Charente River, 22 miles west of Angoulême. It is situated on a hill crowned by an old castle. It is famous for the brandy which bears its name and which is exported to all parts of the world, chiefly to England, the north of Europe, and America. Some English houses, established here in 1780, began the manufacture of this brandy and developed its enormous trade.

Cogniet, Leon, lā-ôn kōn-yä, French historical and portrait painter: b. Paris 29 Aug. 1894; d. there 20 Nov. 1880. He studied under Guerin, obtained the Grand Prix de Rome in 1817, and became a member of the Institute in 1849. Many famous artists of a later day were pupils in his studio. The Church of the Madeleine in Paris contains a 'Magdalen' by Cogniet.

Cogno'vit, in law, a written confession given by the defendant that the action of the plaintiff is just, or that he has no available defense.

Cogs'well, Joseph Green, American librarian and bibliographer: b. Ipswich, Mass., 27 Sept. 1786; d. Cambridge, Mass., 26 Nov. 1871. He graduated at Harvard in 1806, and practised law for a few years in Belfast, Maine. He was a tutor at Harvard 1813-15, and after four years of study in Europe he was made professor of geology and mineralogy, and librarian at Harvard. In 1823, in connection with George Bancroft, he founded the famous Round Hill school at Northampton, Mass., the plan and methods of instruction being based on an examination of the best English and German systems of education. The school was discontinued in 1836. After a period of editorship of the New York 'Review,' Cogswell, with John Jacob Astor, Fitz-Greene Halleck, and Washington Irving, formulated the plan of the Astor Library. Cogswell was appointed its chief (1848), a place for which his remarkable attainments as a bibliographer eminently qualified him,—he went abroad to purchase books, and laid the foundation of the present collection with rare discrimination and economy. He presented to it his own fine collection of bibliographical works, and prepared a catalogue of its contents. Advancing years

COGSWELL — COHERER

caused his retirement in 1861. He was a frequent contributor to the leading reviews, such as the 'North American Review,' 'Blackwoods,' and the 'Monthly Anthology.'

Cogswell, Mason Fitch, American physician: b. Canterbury, Conn., 28 Sept. 1761; d. Hartford, Conn., 10 Dec. 1830. He was adopted by Samuel Huntington, president of the Continental Congress and governor of Connecticut, and graduated valedictorian at Yale 1780. He studied medicine with his brother James, at the soldiers' hospital in New York during the Revolution, and eventually became one of the best-known surgeons in the country. He was the first in the United States to remove a cataract from the eye, and to tie the carotid artery (1803). Mainly through his influence the first asylum for deaf-mutes was founded in this country at Hartford, and his daughter Alice was its first pupil. He was also a founder of the Retreat for the Insane in the same city.

Cohen, Alfred J. See DALE, ALLEN.

Co'hen, Jacob da Silva Solis, American physician: b. New York 28 Feb. 1838. He graduated M.D. at the University of Pennsylvania 1860, and in 1861 became assistant surgeon of the 26th Pennsylvania regiment, serving with the expedition to Port Royal and with the South Atlantic blockading squadron till January 1864. In 1866 he settled in practice in Philadelphia, and has made a specialty of diseases of the throat and chest. He has written many important articles and books on these topics, chief of which are: 'Diseases of the Throat and Nasal Passages' (2d ed. 1879); 'The Throat and the Voice' (1880); 'Treatise on Inhalation'; 'Croup in its Relations to Tracheotomy,' and since 1880, 30 other special studies, which have been published in the New York 'Medical Journal,' Philadelphia 'Medical News,' etc.

Cohen, Katherine M., American artist: b. Philadelphia 18 March 1859. Receiving her early training at private schools and Ogontz, Pa., she displayed a taste for art which was developed by study at School of Design, Pennsylvania Academy of Fine Arts, Students' Art League under Saint Gaudens, and six years in Paris schools. She has been engaged in sculpture since 1880 and her chief works have been portraits and bas-reliefs, decorative works and paintings of figure and landscape. Among her principal successes have been: Portrait of Gen. Beaver for Smith Memorial, Fairmount Park; 'The Israelite'; 'Priscilla'; 'Rabbi-ben-Ezra'; 'Romola'; 'Lorna Doone.'

Cohen, Mendes, American civil engineer: b. Baltimore 4 May 1831. Educated in private schools he soon displayed a bent toward engineering, and engaged in practical study at the locomotive works of Ross Winans, Baltimore, 1847-51. His active service became continuous, first at the engineer corps of the B. & O. R.R. 1851-5; then as assistant superintendent Hudson R.R. 1855-61; and, 1861-3, as president and superintendent O. & Miss R.R. (of Illinois). For some years he was engaged in the special service of Phila. & Reading, and became controller and assistant to the president of the Lehigh Coal and Navigation Company. In 1894 he was appointed by President Cleveland as member of the board to examine and report a route

for the Chesapeake & Delaware Ship Canal. In Baltimore he has long been honored with important civic trusts.

Cohen, Solomon, American lawyer: b. Georgetown, S. C., 15 Aug. 1802; d. Savannah, Ga., 14 Aug. 1875. At an early age he became a lawyer and he soon was classed with leading lawyers of his day and State, who directed the political thought and education of the people. In 1838 he settled in Savannah, where he maintained a leading position at the bar, attaining so deserved a popularity that he was sent to the Legislature, and assumed a prominent part in municipal affairs. He was one of the founders of the system of public education in the State. He was appointed postmaster of Savannah by President Pierce, and was continued by President Buchanan, holding the same position under the Confederate government. In 1866 he was elected member of Congress from the first district of Georgia, but was not allowed to serve.

Cohen, Solomon Solis, American physician: b. Philadelphia, 1 Sept. 1857. After a course of study at the Central High School in his native city, he graduated from Jefferson Medical College in 1883. From 1888-1902 he was lecturer in, and since 1902 has been professor of clinical medicine at Jefferson Medical College, and from 1889-1902 professor of clinical medicine and therapeutics at Philadelphia Polyclinic and College of Graduates in Medicine. He was elected president of the Philadelphia County Medical Society, 1898-9. His published writings include: 'Therapeutics of Tuberculosis'; 'Essentials of Diagnosis,' and he has edited 'System of Physiologic Therapeutics.'

Coherer, an electrical instrument, part of the receiver in Marconi's system of wireless telegraphy, consisting of a small glass tube about one and a half inches long, into which two silver plugs are tightly fitted. A small gap separates these plugs, and in this gap a mixture of nickel and silver filings is placed. Under ordinary conditions the resistance of this gap is too high to allow of any current passing from the local cell or battery; but under the influence of electric waves these filings instantly cohere, and the tube becomes a comparatively good conductor. Connected with this tube is a cell and a relay. By the cohesion of the filings the current from the cell is allowed to pass through the tube and actuate the relay. When once this is achieved, it becomes a very simple matter to make a bell ring or work a Morse siphon.

The filings, however, having cohered under the influence of an electric wave, remain in this condition unless shaken up. An automatic tapper, or discoherer, somewhat similar to an electric-bell tapper, minus the bell, is so adjusted as to tap the tube and shake the filings up, thus decohering them and bringing them to their normal condition, when they are again in a state to receive another impulse.

The oscillations set up by the transmitter at a distant station act on the vertical conductor or resonator which is connected with the sensitive tube at the receiving station, cohere the filings in the tube, and allow the local cell to actuate the relay. This, in its turn, causes the larger battery to pass a current through the tapper, or interrupter, and also

COHESION — COHOES

through the electro-magnets of the recording instrument. See WIRELESS TELEGRAPHY.

Cohesion, the force by which the various particles of the same material are kept in contact, forming one continuous mass. Its action is seen in a solid mass of matter, the parts of which cohere with a certain force which resists any mechanical action that would tend to separate them. In different bodies it is exerted with different degrees of strength, and it is measured by the force necessary to pull them asunder. According to Sikingen, the relative cohesive strengths of the metals are as follows:

Gold	150,955
Silver	190,771
Platinum	262,361
Copper	304,696
Soft iron.....	362,927
Hard iron.....	559,880

Cohesion in liquids is very much weaker, the parts being disjoined with much more facility; and in substances existing in the gaseous form it is entirely overcome, the particles repelling instead of attracting each other.

Cohesion in bodies is weakened or overcome by two general causes — by the repulsion communicated by heat, or by the attraction which may be exerted by the particles of one body on those of another.

Heat communicated to a solid body always diminishes the force with which the attraction of aggregation or cohesion is exerted; if the heat be increased to a sufficient extent the cohesion is so far weakened that the body passes into the liquid form; and if carried still farther, the attractive force is entirely overcome, repulsion is established between the particles, and the body passes into the gaseous state.

The same effects are produced by the exertion of that attraction which unites the particles of one body with those of another. If a liquid be poured on a solid, it often happens that their mutual attraction is sufficiently powerful to overcome the cohesion of the solid; its particles are consequently disunited, to combine with those of the liquid, and it entirely disappears. This forms the chemical process of solution (q.v.). A similar effect is sometimes produced by the chemical action of a gaseous body.

When these powers, whether of heat or of chemical attraction, are withdrawn, cohesion resumes its force, but with results which are different, according to the circumstances under which this happens. When the attraction of aggregation is suddenly and forcibly exerted, the particles are united, in general, indiscriminately, and according to no regular law. If a body which has been melted is suddenly cooled to a sufficient extent, it becomes solid, and forms a mass of no regular structure or figure; or if its cohesion has been suspended by the chemical attraction exerted by another body toward it, and if this attraction suddenly ceases to operate, the force of cohesion is resumed, and the solid substance appears in the form of a powder. This latter case forms the chemical operation denominated precipitation (q.v.). But if the force of cohesion is exerted more slowly the particles are united, not indiscriminately, but usually with regularity, so as to form masses of regular structure and figure, bounded by plane surfaces and determinate angles. This forms the operation of crys-

tallization; and such masses are denominated crystals (q.v.).

Cohesion Figures. When small drops of various liquids lighter than water, and slightly soluble in it, are allowed to fall on the surface of perfectly pure water, the drops form curious figures on account of the differences between the capillary tensions of the air surfaces of the liquids. (See CAPILLARITY.) These are called cohesion figures. They were investigated by the late Mr. Tomlinson, the results of whose researches are published in various papers in the 'Philosophical Magazine' since October 1861. Creosote, for example, forms a disk which sails about on the surface with a rapidly quivering motion. Ether, again, forms a circular figure composed of a central boss, surrounded first by a flat depressed ring, and then by a raised ring, the edge of which is waved. Mr. Tomlinson has observed many other liquids. The figures last for a short time, gradually disappearing as the drop becomes dissolved in the water. The slightest impurity in either liquid changes the figure by altering the superficial capillary tension of the liquid. Hence Mr. Tomlinson proposed to observe the figure as a test of the purity of certain essential oils. In applying the test it is necessary to have the water perfectly pure and clean, and Mr. Tomlinson has given special methods of cleansing the glass vessel into which distilled water is put. Mr. Tomlinson has also examined cohesion figures of fluids dropped on other liquids besides water, as coconut oil, castor oil, melted paraffin, etc.

Cohn, kōn, Adolphe, American educator: b. Paris, France, 29 May 1851. He was graduated from the University of Paris in 1868 and served as a volunteer in the French army during the Franco-German war from July 1870 to February 1871. In 1875 he came to New York and taught languages for some years, when his ability secured him a tutorship in French at Columbia University in 1882, in which he served as instructor for two years. He was instructor at Harvard 1884-5, and assistant professor in French 1885-91. In 1891 he became professor of Romance languages and literature at Columbia, which position he still holds. He is a singularly successful teacher, and many of his pupils hold posts of prominence. In addition to numerous contributions to literary periodicals, he has published: 'Voltaire's Prose' (with Woodward) (1897); 'Le Sage's Gil Blas' (with Sanderson) (1899).

Cohobation, an operation in which a fluid is converted into vapor by heat, and is then condensed, but instead of being collected in a separate receiver, as in distillation, it is made to flow back into the heated vessel. It is employed to produce a change in the fluid by continued heating, but more frequently to subject some substance to the action of a fluid without either loss of the latter or the necessity of adding fresh quantities of it.

Cohoes, kō-hōz', N. Y., city of Albany County, at the confluence of the Mohawk and Hudson rivers, and near the junction of the Erie and the Champlain canals, and on the New York Central and the Delaware & Hudson R.R.'s, nine miles north of Albany. The Mohawk River has a fall of over 70 feet at this point, and supplies great power, making Cohoes a very important manufacturing community.

COHORT — COIN

The Mohawk River is crossed by a dam above the falls, and the water is supplied to the mills and factories by means of canals. There were in 1900, 316 manufacturing establishments, capitalized at \$11,316,482, and producing goods to the value of \$11,636,130. The principal manufactures are hosiery and knit goods, foundry and machine shop products, paper boxes, lumber and planing mill products, patent medicines, saddlery and harness, printing and publishing, etc. The city is connected with Albany, Troy, and other neighboring cities by electric street railways. Cohoes was first settled by the Dutch, and for some time a portion of the city was included in the Rensselaer Manor. It was chartered as a city in 1870. Pop. (1900) 23,910.

Co'hort, a division of the Roman army, the tenth part of a legion, containing three maniples or six centuries. The number of men varied with that of the legion, the 10 cohorts always containing an equal number. When the legion numbered 4,000 men, the cohort consisted of 60 triarii, 120 principes, 120 hastati, and 100 velites, in all 400 men. The centurion of the first century of the first maniple of the first cohort was the guardian of the eagle or colors of the legion, and hence the first cohort was always regarded as superior in dignity to the others.

Cohosh, *kō-hōsh'* (*Cimicifuga racemosa*), also called black snakeroot, is a plant belonging to the crowfoot family (*Ranunculaceæ*). Besides this species there are about four others also called cohosh, herb-christopher, and rattlesnake herb, which are widely distributed from Nova Scotia and Anticosta, south to Georgia, westward to Missouri, and northward to British Columbia. It is an erect perennial herb growing in woods. The plant has powerful medicinal properties and is a valued remedy in rheumatism, epilepsy, etc. The blue cohosh (*Caulophyllum thalictroides*) is a powerful antispasmodic and emmenagogue. It is also a diaphoretic and diuretic, and has been used successfully in this country as an anthelmintic.

Coif (French, *coiffe*), the badge of serjeants-at-law, who are called serjeants of the coif, from the lawn coif which they wore under their caps when created serjeants. The cap worn by women of religious orders, usually white, and worn under the veil. The name is sometimes given to the small cap worn by monks who have the tonsure.

Coimbatore, *kō-īm-bā-tōr'*, or **Coimbetoor**, British India, a district in Madras presidency, with an area of 7,842 square miles. The country has on the west the range of lofty mountains called the Western Ghats; a continuation of which also bounds it on the north. On the east it is bounded by Salem and Trichinopoly, and south by Madura and Travancore, west by Malabar and Cochin. It is fertile, producing sugar, cotton, rice, and tobacco; and well watered by several rivers. The climate is very malarious in some parts. The principal towns are Coimbatore, Errood, and Carroor. In 1799, on the death of Tipu, and the division of his territories, Coimbatore was ceded to the East India Company.

Coimbatore, British India, city and capital of the district of Coimbatore, situated at the foot of the Western Ghats, on the river Noyel,

90 miles south of Seringapatam, 252 southwest of Madras. It has wide streets, is well built and well drained, has an agreeable climate, and is more suitable for the residence of Europeans than most Indian towns. It suffered much in the wars between the British and Mysore sovereigns. Pop. (1901) 52,968.

Coimbra, *kō-ēm'brā*, Portugal, capital of the province of Beira, on a hill above the Mondego River, here crossed by a stone bridge, 135 miles northeast of Lisbon. Its streets are steep and narrow, its manufactures confined chiefly to earthenware and combs, and its interest consists mainly in its historical associations. The place derives its name from the Roman Conimbria, traces of which lie to the south; it was held by the Goths, and from them passed to the Moors, from whom it was finally conquered in 1064, by Fernando the Great, aided by the gallant Cid. Coimbra was the capital of Portugal for about two centuries and a half from its erection into a kingdom in 1139, and many of the early kings are buried in and around the old town. Of the public buildings, the most noteworthy are the older of the two cathedrals, the Church of San Salvador, and the ruined Convent of Santa Clara; across the river is the Quinta das Lagrimas, "House of Tears," where Inez de Castro was murdered. The University of Coimbra, the only one in Portugal, was originally established at Lisbon in 1288, but was transferred here permanently in 1537. It has five faculties and some 900 students; attached to it are a museum, an observatory, a botanical garden, and a library of over 80,000 volumes.

Coin, Spain, city in the province of Malaga, 21 miles north of the city of Malaga. It consists of well-built houses, spacious and clean streets, three squares,—in the centre of the largest square is a handsome fountain. The chief manufactures are linen and woolen fabrics, esparto mats, soap, paper, hempen shoes, wine and oil. The exports are cattle, grain, and fruits. In the neighboring hills are marble quarries, and jasper of all colors. Pop. 10,000.

Coin. The coin of a nation is said to be the life-blood of its trade. The "Mint" is the place of its origin. Coinage is therefore a monopoly, possessed and exercised by all firmly established governments. The mint of the United States was authorized by Act of Congress 1792, and its general operations began in 1793. At that time the appliances of coinage were few and crude, the striking of coin being by the old screw hand press, and the annual output confined to narrow limits. It was not until 1836, when the mint was removed from Seventh Street, Philadelphia, to more commodious quarters at Chestnut and Juniper streets, that improved appliances were introduced. At that time the steam operated coining-press invented by M. Thonnelier, a Frenchman, was introduced, and greatly facilitated the process of minting. Twenty years later this press was remodeled and much improved, continuing in use for 14 years, when it was superseded by the perfected machines now in use. The introduction of the steam coining-press inaugurated the improvements which have made the mint of the United States one of the finest equipped mints in the world. From 1836 to the present time the progress of the mint has been largely experimental. New and improved machinery

COIN

has been added from time to time and improved scientific processes have been adopted. The humid assay process for determining the fineness of gold and silver was introduced in the year 1836. The platinum apparatus for the assay of gold was introduced in 1867. This was an English invention, and a great improvement upon the method formerly in use. Automatic machines for the separation of coin blanks into "standard," "heavy," "light," and condemned "light" pieces were introduced in 1877. Improved rolls for converting ingots into coin strips, as well as gas annealing furnaces, may be said to have completed the equipment of the mint.

The organization of the mint, under the original and subsequent Acts of Congress, and until 1873, provided for a director, located at the parent mint at Philadelphia, an assayer, melter and refiner, coiner, and engraver of dies, with a necessary subordinate clerical force, the assayer, melter and refiner, coiner, and engraver, being designated as "operative officers." The director was subject to the orders of the Secretary of the Treasury. After the creation of branch mints and assay offices the heads of such institutions reported to the director at Philadelphia. By the Act of 1873 the mint was reorganized, with a bureau at Washington, where the director was located. The resident chief officer at the mint was by that Act designated as superintendent, ranking with the chief officers of the mints at San Francisco and at New Orleans, and the chief of the assay office at New York. The chief officers of the branch mints and minor assay offices were designated as "assayers-in-charge," reporting to the director at Washington. The mint service is now under this reorganized form. The superintendents and the operative officers are appointed by the President and hold their official positions at his pleasure.

The processes of the mint can best be considered under the head of routine. The mint purchases at its counter all gold presented in value not less than \$100, providing the deposit is not too base for economical conversion into coin or fine bars. All deposits are made with the weigh clerk at the weigh room, who carefully weighs the same on the delicate balances, which are adjusted to show variations of one hundredth of a troy ounce. The weight is carefully recorded in the books of the weigh clerk and registrar of deposits, together with the description of the bullion and the name of the depositor, both officers being present and carefully noting the same. The deposit is then locked in a copper box and sent to the deposit melting room, where it is melted and cast in the form of a bar. From this bar the assayer cuts clips, weighing from 18 to 20 one hundredths of an ounce, two clips being taken, one from the upper side at one end, the other from the under side at the other end. These clips are assayed separately to determine the homogeneity of the metal. This assay determines the proportions of fine metal in the bar, and upon this assay the money value is determined and the depositor is paid. The loss of weight by melting is carefully noted and recorded. A slight allowance is made after melting to the melter and refiner and the weight so established becomes the true weight. As soon as the fineness of a day's deposits is reported by the

assayer, they are delivered to the melter and refiner, and by that officer sent to the refinery, where the silver is separated from the gold and the base metals eliminated wholly, only the precious metals being accounted for.

The next step in the conversion of bullion into coin is the assembling of the refined metal into "melts" of about 3,000 ounces to which sufficient copper is added to render the melted mass 900 parts fine, which is the standard fineness of United States gold and silver coin. When melted the metal is cast into ingots of the size proper for the production of the coin required. This alloy is rigidly tested by assay, and if found standard within the legal tolerance it is so declared, and the ingots are delivered to the coiner for conversion into coin. They are first taken to the rolls, "broken down," annealed, and delivered at the finishing rolls, where they are converted into coin strips of the requisite thickness for coin blanks. The strips are then taken to the cutting machines, where they are converted into coin blanks which go to the selecting tables for the elimination of imperfect pieces and fragments. The accepted blanks are then sent to the adjusting room, where, if gold, each piece is weighed, the heavy pieces being reduced by filing and brought within the limit of legal tolerance. If the blanks be silver they are passed through automatic selecting machines which separates them into standards, heavies, lights, within tolerance, and condemned lights. The blanks are next passed into a machine and "upset," or "milled," which process so raises the edge of the piece as to protect the work on the stamped coin from abrasion. The blanks are then annealed, treated to a dilute sulphuric acid bath, and cleansed and brightened, and when thoroughly dried are ready for the coining presses. These presses work automatically, the only hand action being to fill the feeding tubes. The pieces are automatically seized by conveyers and centered between the obverse and reverse dies within a collar a little exceeding the piece in diameter. The impact of the dies, brought together by the operation of a toggle joint, forces the metal to flow to the full diameter of the collar, which is grooved inside, and puts a fine reeding upon the edge of the coin. The finished coin is then automatically passed on, and is followed by others, the delivery for large coins being at the rate of 80 or 90 per minute. Dimes are struck at the rate of 100 and 120 per minute.

The standard, heavy, and light coins are then separately counted by gauge, and made into drafts of \$5,000 each, if gold, and drafts of \$1,000 each, if silver. As the standard weight of gold drafts of \$5,000 is 268.75 troy ounces, the standard, heavy, and light coins are mingled in due proportion to make that standard weight, no greater variation than 1/100 of an ounce being allowed. The standard weight of \$1,000 in silver dollars is 859.375 ounces, and of subsidiary silver 803.75 ounces, with a tolerance of 2/100 of an ounce. The perfected drafts are then weighed in the presence of the superintendent, enclosed in canvas bags, and delivered to that officer. The mint balances are adjusted to the troy pound (5,760 grains) which is the mint unit of weight. This weight is a duplicate of the troy pound established by a royal commission in England in 1758, reaffirmed in 1838. It is kept in a special safe at the Phila-

COINAGE

delphia mint. In order to secure an exact conformity in weight and fineness of United States coin, a fixed number of coins is taken from every delivery, sealed in the presence of the superintendent and the assayer, and deposited in a receptacle called "the pyx," each of those officers having a key, both keys being required to open the pyx. These reserved pieces await the assembling of the Assay Commission, annually appointed by the President to meet on the second Wednesday in February, when the pyx is opened and exhaustive tests of the weight and fineness of the contents are made.

Location and Equipment.—The mint of the United States is located on Spring Garden Street between Sixteenth and Seventeenth streets, Philadelphia. The construction is of light granite and of the Roman Ionic order. It has an interior ground floor space of 58,000 square feet. Its equipment consists of eight boilers of 1,200 horse power capacity, for heating, ventilating, and electric lighting. To avoid the transfer of power by shafting the machinery is chiefly operated by independent motors. The building is lighted by 4,000 incandescent and 16 arc lights. There are 51 telephones connecting the departments and various offices. A gas plant capable of delivering upward of 20,000 cubic feet per hour furnishes fuel for the melting, annealing, and assaying furnaces. The ventilating is by fans operated by attached motors. The spacious melting department is equipped with 13 gas and 3 coal heated furnaces, with power topping machines. The coining department has 23 coining-presses with an average capacity of 110 pieces of finished coin, each, per minute; 10 milling, or upsetting machines, each capable of an out-turn of an average of 500 milled blanks per minute; a full equipment of trains of break-down and finishing rolls; 8 strip annealing gas furnaces, and 1 furnace for annealing blanks; 8 automatic presses for cutting blanks from coin strips; 6 automatic weighing machines for the separation of blanks into standard, heavy, light, and condemned pieces, together with appliances for cleaning, whitening, and drying blanks after annealing. The assaying department is equipped with every known appliance for determining the fineness of gold and silver, both by the platinum and the humid processes. The refinery operates largely the acid process of separating, but it has a plant for refining by electrolysis, and the process has proved a success, considerably increasing the capacity of the refinery.

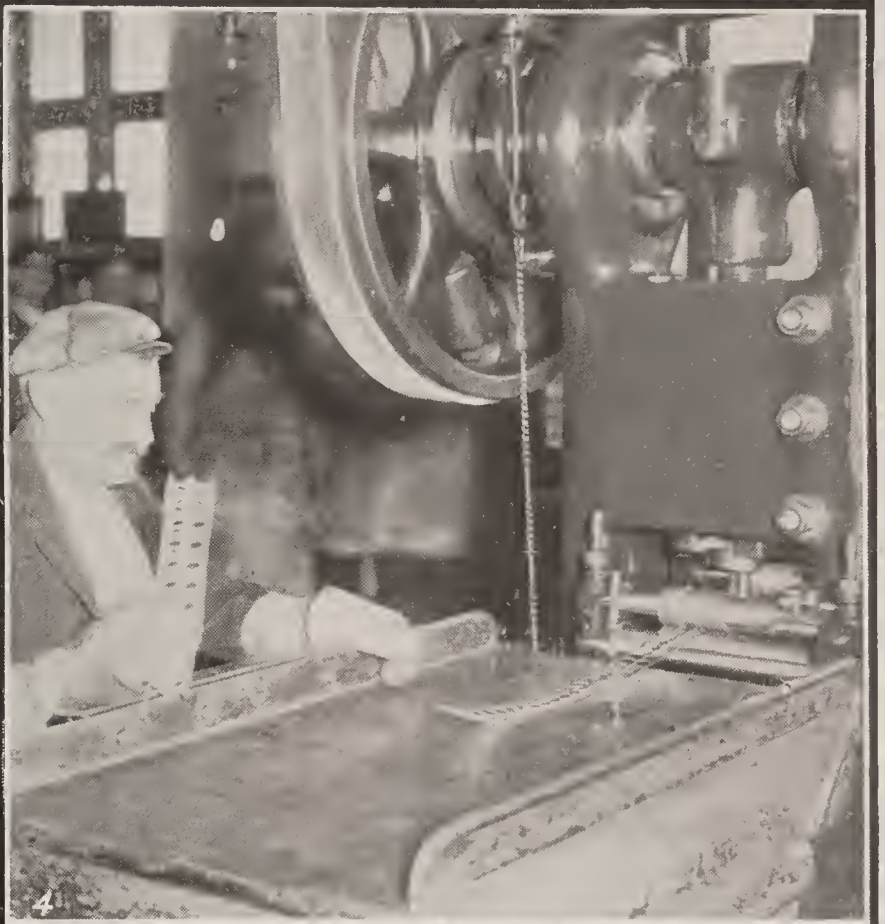
The engraving department provides all of the coin dies used in the mints of the United States. It has every facility for die-sinking, hubbing, and annealing the steel from which dies are produced, as well as a geometric lathe for transferring designs. The department for the manufacture of medals of a national character is in charge of the engraver, who provides the dies. The medal department is equipped with three hydraulic presses of the respective capacity for exerting a pressure of 1,100, 400, and 300 tons. These powerful presses are operated by electric motors. The machine shop has every appliance for the construction, or the assembling and finishing, of all machinery used in the mint. There are 20 steel-lined vaults for the storage of coin and bullion and for the use of the operative officers. One of these vaults has a floor-space of 5,200

square feet, with a storage capacity of 112,000,000 silver dollars. Another has a floor-space of 4,160 square feet. Six others have each a floor-space of 2,562 square feet. The basement vaults are built wholly independent of the enclosing walls, with a free passageway around them. The doors are massive, and provided with the finest locks procurable, to which time-locks are attached. More than 3,250,000 pounds of steel enter into the construction of these vaults. The vestibule is highly ornate, the corridor extending through the cross section from east to west is finished in richly variegated marble, and the main staircase is of white marble. The floors are of messanine, the symbolic panels in the vestibule of glass mosaic. The ceilings are finished in white and gold.

The cabinet, or museum, is in a spacious room at the head of the main staircase in the rotunda. It contains a fine collection of the coins of all nations, ancient and modern, a full line of medals of a national character, and many rare medals of foreign countries. There is also a fine collection of curios, many of them collected in distant lands. The working capacity of the mint considerably exceeds the national demand for its product. Congress has therefore authorized coinage for other nations at a fair remuneration. Pursuant to this authorization the mint has coined much gold and silver, as well as copper and nickel coin, for several of the South American and most of the Central American states. Prior to the annexation, the mint at San Francisco coined money for the Sandwich Islands. Admission to the mint is free to the public on every working day between the hours of 9 A.M. and 2 P.M. The building is patrolled day and night by an armed guard.

JOHN H. LANDIS,
Supt. United States Mint, Philadelphia.

Coinage, the process of converting an authorized alloy of the money metals into the circulable coin of the country. The metal is alloyed and cast into ingots of sizes suitable to the production of the denomination of the coins required. Thus, for the double eagles, our largest gold coin, the ingot is cast $12\frac{5}{8}$ inches in length, $1\frac{1}{2}$ inches in width, and half an inch in thickness. Such an ingot weighs about 80 ounces troy, of the approximate value of \$1,488. The ingots for the eagles are cast 11 15-16 inches in length, 1 2-16 inches in width and half an inch in thickness. The weight of such an ingot is about 62 ounces troy. The half eagle requires an ingot 12 inches in length, $\frac{7}{8}$ inch in width and 7-16 inch in thickness. The ingots are taken to the break-down rolls in drafts of about 50 ingots, where they are passed through the rolls several times, according as they prove more or less malleable. If passed through the rolls six times the dimensions of a double eagle ingot will be increased to $26\frac{1}{4}$ inches in length, 1 9-16 inches in width, and 7-32 inch in thickness. The broken-down ingots are then sent to the annealing furnace, heated by gas fuel to about 1,500 degrees F. and being laid singly upon a carrier traveling the whole length of the furnace, remain until the strips become a uniform cherry-red. They are then removed and plunged into a bath of cold water to remain until cool enough to handle. The strips are then wiped dry and passed on to the finishing rolls.



¹ \$50,000,000 in Gold Bars. ² Casting Silver Bars. ³ Rolling Silver Bars to the Thickness of Silver Dollars.
⁴ Cutting Silver Planchets, or Blanks. ⁵ Striking the Impression. ⁶ Counting Cents.

THE MANUFACTURE OF COINS AS CARRIED ON AT THE UNITED STATES MINT, PHILA., PA.

COINAGE

The next step will depend upon the condition of the metal. Should it retain indications of the hardness and springiness resulting to the breakdown process, it is subjected to a second breakdown by being passed three or four times through the rolls. The malleability of the metal being sufficient, the strips are taken to the finishing rolls or "rolls of precision." After being passed through these rolls four times the strips develop the required thickness and uniformity for the production of blanks. At this stage the double eagle strip attains a length of $47\frac{3}{8}$ inches, a width of $15\frac{5}{8}$ inches and is reduced to a thickness of 7-64 of an inch. For ease in handling the strips are now cut in half by multiple shears and delivered at the cutting presses, where test planchets are cut from several strips and weighed, to determine if the strip, when converted into planchets (coin blanks), approximates to standard weight. The cutting presses are automatic. The strip is seized by a grip and drawn under a steel punch working in a matrix cutting the planchets at the rate of 80 each minute. The planchets are next cleansed and sent to the selecting table where the imperfect pieces are separated from the perfect and the latter are sent to the adjusting room. The adjusting consists in the careful weighing of each blank separately to ascertain if it corresponds to the standard weight and legal tolerance, the latter being for double eagles and eagles $\frac{1}{2}$ grain per piece, and $\frac{1}{4}$ grain each for half eagles and quarter eagles. Pieces found in excess of legal weight and tolerance are reduced by filing the edges until they conform to the limit. Such pieces are placed by themselves and marked "heavies." Pieces a little less than the standard weight, but within the limit of legal tolerance, are placed in another receptacle and marked "lights." Those found of exact legal weight are placed in another receptacle and marked "standard."

The planchets so adjusted are then taken to the milling machines by the operation of which a protecting edge is raised on each piece. This edge is to preserve the face of the coin from abrasion. When milled the planchets are conveyed to the cleaning room where they are annealed until of a cherry-red and then treated to a bath of dilute sulphuric acid, by which process they are thoroughly cleansed and brightened. The annealing of the planchets after the milling process having prepared them for the stamping, when cleansed and brightened they are washed in boiling water, dried by riddling in sawdust, when they are ready for the coining press. It will be understood that the three descriptions of blanks, namely: "Heavies," "lights," and "standards"—have been kept separate throughout the processes, and are never mingled until the coiner makes up the drafts of finished coin for bagging. The planchets therefore go to the presses by those divisions.

The coining press used in all first-class mints is a wonderful exhibition of mechanical skill. Its frame is of cast-iron of several tons weight, with a central arch in which are placed the working parts. The frame combines stability and rigidity. The mechanism of the working parts is automatic. The setting of the dies is a work of precision and can be properly done only by a person, who, being a skilled mechanic, has reinforced his native ability by long experience. In order to set his dies properly he must

take into account the condition of the metal to be stamped, whether it be soft and ductile or hard and brittle. Upon these qualities of the metal depends the distance apart of the dies at the moment of their impact upon the planchets. The blanks are fed into a vertical tube of equal diameter, and when the press is in motion automatic fingers seize the bottom planchet by its periphery and carry it forward to a collar, a little larger than the piece to be stamped. The piece drops into the collar, and a toggle joint causes the dies to approach each other and exert a pressure of about 160 tons upon the soft planchet. The planchet, being ductile, is by this pressure made to fill the entire space within the collar, which is grooved, and imparts the reeding to the edge of the coin. The finished coin is automatically released and falls into a pan below, to be followed by other coins at the rate of 90 or 120 per minute. The first number relates to large gold coins and silver dollars, the latter to small gold and small silver coins. It should perhaps be stated here that while the essential processes in coining are the same in all modern mints the routine is not uniform. In the mint of the United States the coin after stamping is returned to the adjusting room and each piece weighed separately. The necessity for this arises out of the possibly defective rolling of the strip from which the blank is derived. The density of the metal varies somewhat, and there may be also defective sonority developed in the process of stamping. In order to secure sonorous coin it is sometimes the practice to ring every piece (this relates to gold coin and silver dollars), and if any fail to give the proper tone they are rejected and sent to the melting pot. The pieces which stand the test are then returned to the coiner for conversion into uniform drafts for delivery to the superintendent, or other officer authorized to receive and hold coined money of the government.

As a matter of law and regulation the coiner is required to make up gold coin into drafts of \$5,000 of the uniform weight of 268.75 troy ounces. As the weight of the pieces separately weighed are not uniform, though all within the limit of legal tolerance, the coin is separated by the adjusters into "heavies," "lights," and "standard." Gold coins may vary from $\frac{1}{4}$ of a grain in the half and quarter eagles to $\frac{1}{2}$ a grain in double eagles and eagles. The coiner takes "heavies," "lights," and "standards" in such proportions as will make drafts of 268.75 ounces and mingles them in the delivery pans. The drafts are then weighed, after counting the pieces in detail, and being found of the required weight, are set aside for final delivery. The drafts must not vary to exceed 1-100th of an ounce above or below the standard weight of \$5,000, stated in the foregoing. Before delivery to the superintendent the latter takes a good number of pieces at random from the proposed delivery and carefully weighs them. If found within the legal limit of tolerance the delivery is accepted; but if the weight of any piece proves it outside that limit the delivery is rejected, to be weighed, readjusted, and recounted. It is proper to say that such a necessity seldom arises.

The practice now is to adjust all silver coins, excepting dimes. Dollars are made in drafts of \$1,000 of the weight of 859.375 ounces. These

COINAGE

drafts are constituted of "heavies," "lights," and "standard," and the only variation from that standard weight is 2-100 of an ounce. Subsidiary silver coin is delivered in drafts of \$1,000, of a weight of 803.75 ounces, with an allowance of 2-100 of an ounce for half and quarter dollars, which are adjusted, and 1-100 of an ounce for dimes, which are not adjusted. It will be seen that all of the processes involved in coining money are works of precision, from the breaking down of the ingot to the issue of the perfect coin. All must be rigidly calculated, nothing can be left to chance. The presence of any of the base metals, as well as of the rare and valuable ones, may destroy the ingot for coinage. Arsenic lead and antimony cause most of the unworkability of the money metals, but this disability is lessening through the processes of advanced science.

Great advances have been made in the processes involved in coining as conducted in modern times. The substitution of the coining press operated by power for the hand screw press of olden times practically revolutionized the business. The introduction of automatic weighing machines for separating the blanks into "heavies," "lights," "standard," and "condemned," has simplified the process of adjusting. In fact the silver coins, with the exception of dimes, are now separated by the automatic weighing machines. The very great improvement in rolls for producing the coin strips from the ingot has made this new and rapid mode of selection possible. The draw-bench, made necessary to cure the defects of the rolls, has practically disappeared. Constant trying has produced rolls of such precision that the thickness of a coin strip can be regulated to the thousandths if required.

The automatic selecting machine in use at the mint of the United States at Philadelphia was invented and constructed by Seyesse, an Austrian, at Vienna. The blanks are fed into the machine through a vertical tube the size of the diameter of the blank. The feed is automatic and the pieces are conveyed into minute balances finely adjusted to grains, and by a complex and ingenious arrangement of parts are, according to weight, whether light, heavy, standard, or condemned lights; shunted into the conduits strictly according to their varying weights, and through these conduits, or ways, are delivered, each to its proper receptacle at the discharge end of the machine. The standard and the accepted light pieces are then ready for milling. The heavy pieces are adjusted by weighing on a delicate balance, and if found to exceed the legal tolerance are reduced by filing the edge of the piece. By this method the necessity for hand adjusting is minimized, and the rapid production of coin greatly facilitated. Other automatic selecting machines are employed in the mints of foreign countries, but have not been found so satisfactory as the Austrian machine, in this country.

One of the most difficult of the processes of coining has been the annealing process, because it is vital to the successful reduction of the ingot to the coin strip. Formerly the process was conducted in a furnace heated by wood fires. Much depended upon the fuel. Perfectly seasoned hard wood, preferably oak, was required for good work. In annealing gold strips in a

wood furnace the strips were enclosed in copper canisters, sealed to air tightness, and remained in the furnace about three fourths of an hour. Silver strips were sometimes subjected to the heat for an hour or more. In all annealing of strips in the wood-fire furnaces the strips were superposed unavoidably, and it was not always easy to determine when the draft reached a uniform cherry-redness. Delays, and refractory metal, were common with the old method of annealing. Besides, the method was the reverse of economical, owing to oxidation of the metal.

In substituting the gas annealing furnace for the wood-fire furnace the work of rolling the metal soon became a work of precision. A considerable saving of time was also effected. The gas annealing furnace for strips has a heating chamber 10 feet in length, 17½ inches in width, and 10 inches in depth. A score of hollow rolls, named "conveyers," mounted on hollow shafts of cast-iron, are so ribbed as to divide the face into several parts conformed to the width of the strips. These ribs separate the strips and prevent superposition. The gas burners enter the heating chamber at the bottom and are in sections, in order to secure independent control. Through these burners a mixture of gas and air is injected along the whole length of the chamber. The strips to be annealed are placed on the rolls at the entrance of the furnace, the rolls are rotated by worm wheels, and pass entirely through the chamber, to enter a hood at the discharge end of the furnace. In this hood the strips, now of a cherry-red, are met by a flame surcharged with gas to prevent oxidation. A spray of water is applied to the strips outside the hood to cool them before they reach the air. This prevents the oxidation of the copper with which the metal is alloyed. The process thus described occupies about six minutes, instead of the hour, or even more, by the wood-fire furnaces. The time required in annealing silver is about 20 or 25 minutes as to the larger denominations. Dimes, however, not being adjusted, and the coin strip being produced from the dollar ingot, require a more prolonged annealing. The improvement in annealing has made it possible to produce from the ingot strips as high as 83 to 96 per cent of standard blanks, and blanks within the limit of tolerance, suitable for coining. This high percentage of good blanks is undoubtedly due to improved annealing and rolling. It is a higher percentage than has ever been secured when the defects in annealing and rolling were in part remedied by the draw-bench. As that machine is still employed in mints not strictly up to date, it may not be amiss to say, that in principle the draw-bench is a wire-drawing machine. As under the old mode of developing the ingot into the coin strip the ductility of the strip was not uniform, some parts being more refractory than others, and hence not reduced to a uniform thickness by the rolls. It was found necessary to pass the strips through a rigid die. The strips were then pointed so as to be firmly gripped by the nippers of the draw-bench which, retreating, drew the strip through the rigid die and gave it a uniform thickness, now imparted by rolls of precision without wasteful annealing. This improvement not only works a reduction of waste, but saves a delay between the finishing rolls and the cutting presses.

COIR — COKE

The preparation of the strips, the cutting of the blanks and the striking of medals is, at the mint of the United States, part of the coiner's duty. Medals may be of gold, silver, copper, or alloys of copper. The strips are rolled to the required thickness, which is usually with reference to the diameter of the proposed medal. The strips are then conveyed to the cutting press of great power and converted into blanks, which are annealed and placed between the dies of a hydraulic press capable of delivering a blow of from 300 to 1,100 tons. Nearly all medals of a national character require from three to six blows, owing to the high relief of the design and the sluggish flow of a large quantity of metal. Medals three inches in diameter require a press of higher power, and must be annealed after each blow until the finishing blow is delivered. The process of medal striking is therefore necessarily slow. Small medals of low relief may be struck by an ordinary coining press. Gold and silver medals of a national character are, respectively, of metal practically fine.

The processes of coining are of such precision that seldom a single piece in a million pieces will be found beyond the legal tolerance of $1\frac{1}{2}$ grains for silver and from $\frac{1}{4}$ to $\frac{1}{2}$ grain for gold.

JOHN H. LANDIS,

Supt. United States Mint, Philadelphia.

Coir, kīr, the outer coating of the coconut, often weighing from one to two pounds; when stripped off longitudinally it furnishes fibres from which are manufactured matting, bagging, sails, ropes, and cables. The general preparation is simple; after being soaked for some months in water the fibrous coats become soft; they are then beaten to remove the other substances with which they are mixed, which fall away like sawdust. The fibres thus cleaned are ready for being spun into long yarns, woven into sailcloth, or twisted into cables. Cordage made of this material rots in fresh water and snaps in frost, but from the fact of its being strengthened by salt water, and its extreme buoyancy as compared with hemp cables, floating as it does in water, and also its great strength and elasticity, it is preferable in many respects to ropes of hemp. It has been proposed to employ it in the construction of deep-sea telegraphs, as being much cheaper and lighter than gutta-percha.

Coire, kwär, or **Chur**, Switzerland, capital of the canton of the Grisons, on the rivers Plessur and Rhine. It is irregularly built, and possesses many houses in the ancient style of architecture. The most remarkable buildings are the old Romanesque cathedral, partly dating from the 8th century, and the old Episcopal palace. Adjoining this is a lofty tower believed to be of Roman origin. Among modern buildings are a Protestant church, government buildings, and a hospital. Not far from Coire the Rhine begins to be navigable for small vessels. Until 1498 Coire was a free imperial city, but at that time came under the government of the bishop, who was under the Archbishop of Mentz. After having been repeatedly in the hands of the Austrians, French, and Swiss, in 1802 it was definitely united to the Swiss republic. Pop. 9,500.

Coit, James Milnor, American educator: b. Harrisburg, Pa., 31 Jan. 1845. He graduated

at Hobart College 1865, and was manager of the Cleveland Tube Works 1873-5. In 1876 he became master in natural sciences at St. Paul's School, Concord, N. H., and is now (1903) acting head master there. He is a member of the leading scientific societies of the country, and has published: 'Manual of Chemical Arithmetic' (1886); 'Treatise on the X-Rays and Their Relation to the Medical and Surgical Sciences' (1897); 'Liquid Air' (1899).

Coit, Stanton, American lecturer on ethics: b. Columbus, Ohio, 11 Aug. 1857. He was educated at Amherst and Columbia colleges, and Berlin University, and has for many years lived and lectured in London, England, where he is chairman of the West London Ethical Society. He has published in German and Dutch, 'The Ethical Movement in Religion'; in English, German, and Dutch, 'Neighborhood Guilds.'

Cojutepeque, Central America, a town in the republic of Salvador, and on the direct route between the town of San Salvador and San Vincente. There is a lake of same name at some miles distance, the fish of which are often cast ashore dead in considerable quantities. Pop. 5,000.

Coke, kōk, **SIR EDWARD**, English jurist: b. Mileham, Norfolk, 1 Feb. 1552; d. Stoke Pogis 3 Sept. 1634. He was educated at Trinity College, Cambridge. From the university he went to London, and entered the Inner Temple. He pleaded his first cause in 1578, and was appointed reader of Lyon's Inn, where his lectures were much frequented. His reputation and practice rapidly increased, and he was placed in a situation of great respectability and affluence by a marriage with a co-heiress of the Paston family. He was chosen recorder of the cities of Norwich and of Coventry; was engaged in all the great causes at Westminster Hall, and in the 35th year of Elizabeth chosen knight of the shire for his county, and speaker of the House of Commons. In 1592 he became solicitor-general, and soon after was appointed attorney-general. He acted the usual part of a crown lawyer in all state prosecutions; and one of the most important that fell under his management, as attorney-general, was that of Essex, which he conducted with great asperity. Soon after the accession of James I. he was knighted. The celebrated trial of Sir Walter Raleigh followed, in which Coke displayed a degree of arrogance to the court, and of rancor and insult toward the prisoner, which was universally condemned at the time, and has been deemed by all posterity one of the greatest stains upon his character. On the discovery of the gunpowder plot he obtained great credit by the clearness and sagacity with which he stated the evidence; and in 1613 he succeeded to the important office of chief justice of the Court of King's Bench, but was in much less favor with James than his rival Lord Bacon. He was, in fact, too wary and staunch a lawyer to commit himself on the subject of prerogative; and as his temper was rough, and his attachment to law truly professional, he could scarcely forbear involving himself with a court so notorious for arbitrary principles as was the English during the reign of James. The honorable zeal which he displayed in the execrable affair of Sir Thomas Overbury, and in the prosecution of

COKE

the king's wretched minions, Somerset and his countess, for that atrocious murder, made him enemies; and advantage was taken of a dispute, in which he erroneously engaged with the Court of Chancery, to remove him, in 1616, both from the council and his post of chief justice. His real offense, however, was a refusal to favor the new favorite Villiers in some pecuniary matter. Coke was reinstated in the council in 1617, and actively engaged in prosecutions for corruption in office, and other crimes of a nature to recruit an exhausted treasury by the infliction of exorbitant fines. On the accession of Charles I. he was nominated sheriff of Buckinghamshire, in order to prevent his being chosen member for the county, which, however, he represented in the Parliament which met in 1628. The remainder of his career was highly popular; he greatly distinguished himself by his speeches for redress of grievances; vindicated the right of the Commons to proceed against any individual, however exalted; openly named Buckingham as the cause of the misfortunes of the kingdom; and, finally, sealed his services to the popular part of the constitution, by proposing and framing the famous "Petition of Rights," the most explicit declaration of English liberty which had as yet appeared. This was the last of his public acts. His principal works are: 'Reports,' from 1600 to 1615; 'A Book of Entries' (1614); 'Institutes of the Laws of England,' in four parts; the first of which contains the commentary on Littleton's 'Tenures'; the second, a commentary on Magna Charta and other statutes; the third, the criminal laws or pleas of the crown; the fourth, an account of the jurisdiction of all the courts in the kingdom; 'A Treatise of Bail and Mainprise' (1636); 'Reading on the Statute of Fines, 27 Edward I.' (4to); 'Complete Copyholder' (1640).

Coke, Thomas, first bishop of the Methodist Episcopal Church in the United States: b. Brecon, South Wales, 9 Sept. 1747; d. at sea 2 May 1814. He was educated at Oxford, and entering the ministry of the Established Church, obtained a curacy at South Petherton. Sympathizing strongly with the Methodists, he sought an interview with Wesley, which resulted in his joining that society, and being appointed to London. He rendered valuable assistance to Wesley in procuring what was called the deed of declaration, which provided for the settlement of the Methodist chapels in the connection, and restricted the conference to 100 of the preachers and their successors forever. He was appointed president of the Irish conference in 1782. Wesley set apart Coke by ordination as bishop of the Methodist Church in America, and gave him authority to ordain Francis Asbury to the same office as joint superintendent. In 1784 he arrived in New York, and proceeded on the 27th to ordain Asbury a bishop, and as such they were duly accredited as the joint superintendents of the Church in America. In company with Asbury he traveled, visiting the different conferences, until June 1785, when he returned to England, and visited Wales, Scotland, and Ireland. Subsequently he returned to America. The first mission which he established was in the West Indies, in 1786, whence, after visiting the several islands, he went to South Carolina

and engaged again in the regular work of the episcopacy. After traveling through the States, he embarked from Philadelphia for England in 1787. He revisited the West Indian and other American missions again and again, crossing the Atlantic 18 times in all. He was a prolific author and published: 'Commentary on the Holy Scriptures' (1803-7); 'Life of Wesley' (1792); 'History of the West Indies' (1808); etc.

Coke.—*Introduction.*—One of the most important fuels of to-day is coke. It has influenced to a greater extent than any other one fuel the immense advances made in the iron and steel industry of the present time. The immense production of pig iron is due in a great measure to its peculiar adaptability to the special requirements of the blast furnace. Its manufacture has influenced many millions of dollars invested in the development of its by-products, and from these by-products have been developed, especially in Continental Europe, many important industries. Tar is the raw material in the aniline dye and briquette industry, as well as others of great importance; from the gas, light, fuel and oils are obtained, and from the ammonia, sulphate, the anhydrous and aqua ammonia utilized to such a large extent in refrigerator plants. The present is an "era of coke," as well as of iron, steel, and electricity, for without this wonderful fuel the others would hardly have been possible.

Definition.—Coke is the product remaining from the dry distillation of bituminous coal.

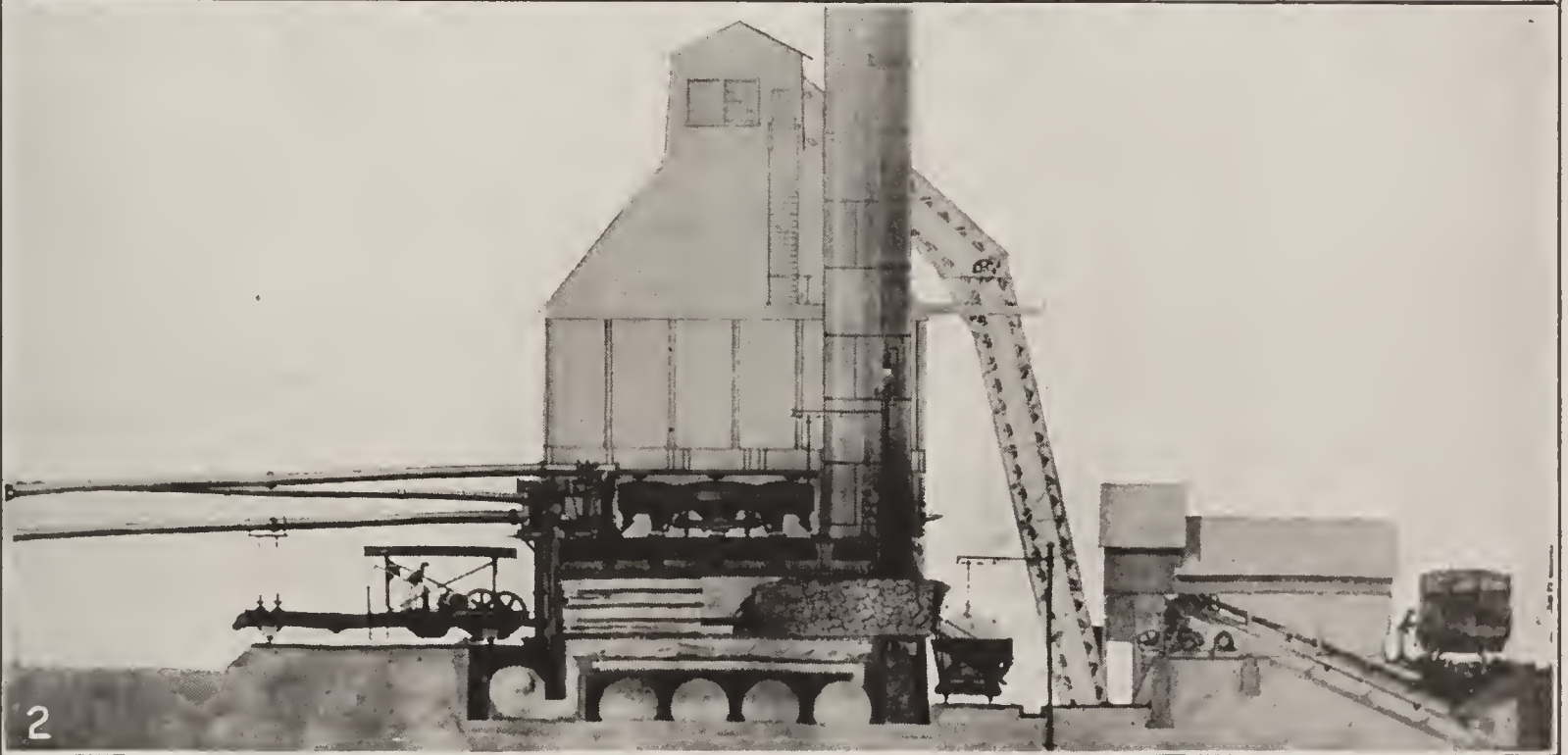
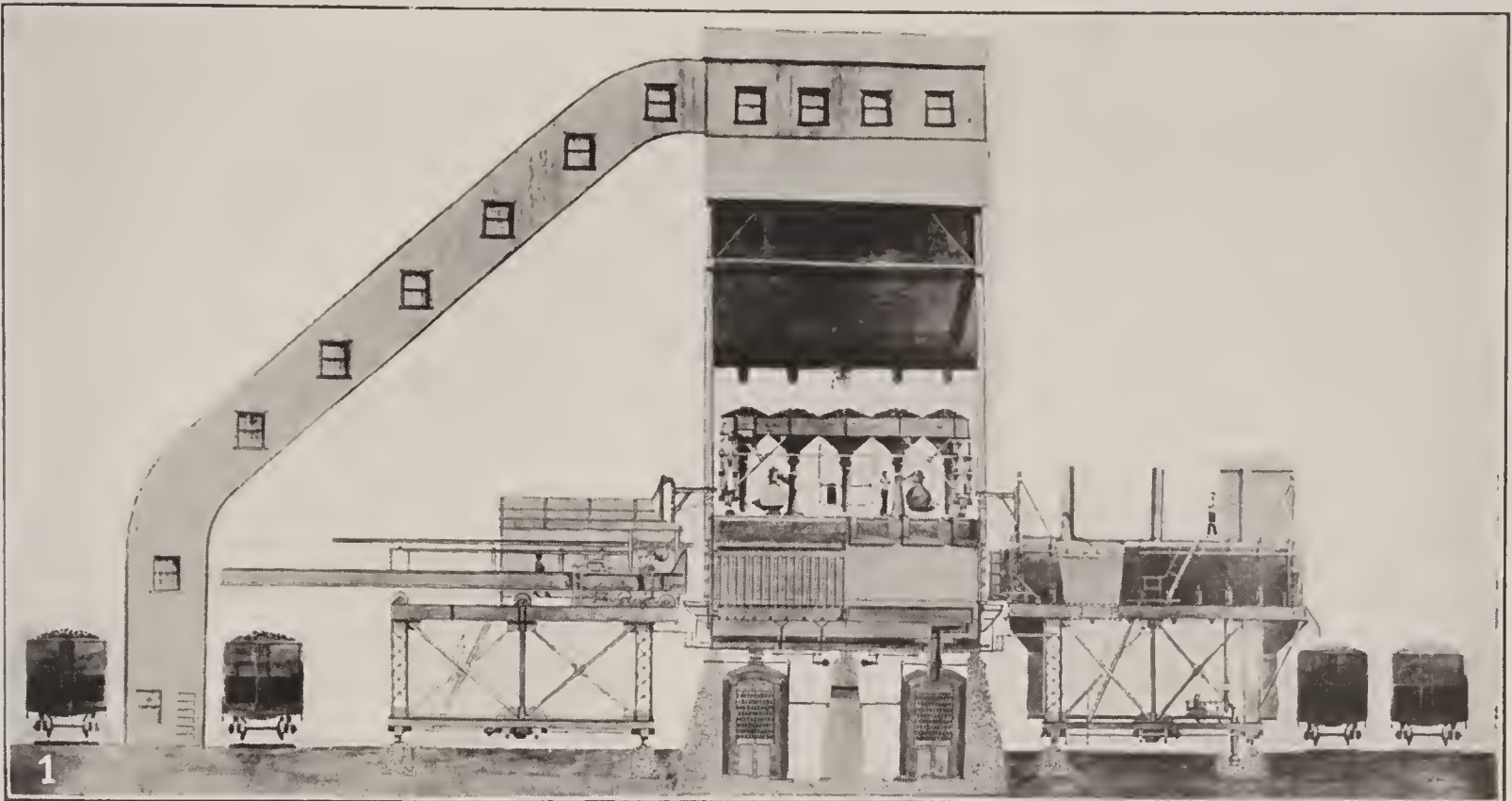
CHEMICAL ANALYSES.

	Connells-ville	Connells-ville	Foundry	Foundry	Foundry
	Standard Connells-ville 72 hr. Coke Labty No. 1165	Standard Connells-ville 48 hr. Coke Labty No. 1166	"G" = Gauley Mountain Labty. No. 1493	"M S" = Milwaukee Solvay Labty. No. 1494	"C" = Connells-ville. Labty. No. 1500
Proximate Analysis: <i>a</i>					
Moisture.....	0.23	0.19	0.75	0.27	0.18
Volatile combustible.....	1.32	.51	.35	.48	.32
Fixed Carbon....	88.18	89.60	86.38	89.63	88.75
Ash.....	10.27	9.70	12.52	9.62	10.75
	100.00	100.00	100.00	100.00	100.00
Sulphur.....	.81	.63	.70	.79	.87
Phosphorus.....	.017	.009	.012	.025	.018
Sulphur in Ash....	.....	.....	.04	.12	.033
Specific Gravity of the Coke Substance.....	1.90	1.90	1.91	1.89	1.92
Apparent specific Gravity of the Coke.....	1.00	1.00	1.03	1.02	.99
Percentage of Porosity.....	47.	47.	46.	46.	.48

(a) Analysis of sample as received.

Discovery and History.—The exact date of the discovery, of the beginning of coke manufacture is not clear. Coke is reported to have been an article of commerce in the Chinese province of Hunan some 2,000 years ago. As far as is known, the coking or "charking" of coal in Europe was an offshoot of the charcoal industry that flourished extensively in the middle ages. Coke was made in Germany in 1584, at the Hohenbuechen mines in the Harz, by Duke Julius von Braunschweig-Lüneberg, and at about the same time the master of the Anhalt mint, Daniel Stumpfelt, made a similar discovery. It appears that in both in-

COKE



1. By-product Coke Ovens. United Otto System.
2. By-product Coke Ovens. Semet Solvay System.
3. Bee Hive Coke Oven.

COKE

stances the coke was desired for use as a smokeless fuel, rather than for iron smelting, a use that developed later on. In England a patent for the "de-sulphurizing" of bituminous coal was granted to the Dean of York in 1590, and in 1619 Dud Dudley, an ironmaster of Worcestershire, was successful in making coke.¹ Up to this time the coke appears to have been made in the same way as charcoal, namely by burning in a mound or "meiler," the coal lumps being so piled as to leave draught openings and the whole covered with coal dust or earth. This primitive method gave place to a pit dug in the ground, or to a walled enclosure, into which the coal was piled, and later into a covered structure known as the "bee-hive oven," so-called from its shape. Such an oven was patented by Sir William St. John and others in England in the year 1620, particular mention being made of the use of the coke so made in manufacturing iron or steel. The bee-hive oven did not come into extended use in England until about 1735, when Abraham Darby operated a blast furnace at Colebrookdale, Shropshire, with coke, an example soon followed by others. This innovation was hastened by the increasing scarcity of wood for charcoal, which was the fuel first used for iron smelting. In France, Gabriel Jars, who had visited the English iron-works, is reported to have introduced the use of coke at the iron works in Sainbel. In Germany, Prince Wilhelm Heinrich made coke in closed muffle-ovens of peculiar design, at Sulzbach near Saarbruecken, in 1767, and with it made, it is stated, the first coke-smelted iron on the Continent, at the Fischbacher furnace, near Sulzbach.*

Bee-hive ovens of the English type were built in rows or batteries, both for convenience in operation and to save the heat radiated from one to another, instead of to the atmosphere. Later, modifications were made in the design of the oven, to improve its thermal efficiency and to cheapen the operation. These gave rise to the elongated shape instead of the round or square section, and the retort type of oven was thus gradually developed. The Belgian oven is typical of this form. In it the coking chamber was from 20 to 30 feet or more in length, 5 or 6 feet high, and 18 to 30 inches wide, closed by movable doors at either end, and the coke was removed by a pushing ram which forced out the coked mass as in the present form of by-product oven. This oven was heated by the gas from the coal, which burned in vertical or horizontal flues built into the walls separating adjacent ovens, air being supplied by ducts from the top, and draught from a stack located at one end of a battery of such ovens, connected with them all by an underground flue. Ovens of this general type were constructed by Rexroth, Coppée and Smet about 1857-60. In 1856, however, Knab was experimenting with a closed retort oven, externally heated, from which he obtained both coke, and by-products, at Comentry, France. A modification of this oven was built by Carvès, and later, by Huessener, who built a plant at Gelsenkirchen, Westphalia, in 1881. At the same time, an experimental

plant of ten ovens was built at Wattenscheid, Germany, by Otto, the two last mentioned being of the true by-product type. Thus, while the origin of the by-product oven may be conceded to the French experiments of Knab, the development was due to Germany. The Wattenscheid experiments gave rise to the type of oven known as the Otto-Hoffmann, since widely extended, particularly in Germany. The modification of the Knab-Carvès oven by Simon, known as the Simon-Carvès oven was of the by-product type, and was further developed by Semet, a Belgian, who in 1881 took out a patent for the oven known as the Semet-Solvay.*

In the United States the beginning of the development of the coke industry dates about 1810-1813. For the same reason that England was forced into its manufacture so was America. The Pennsylvania Society for the Promotion of Internal Improvements about this time sent an expert to England to study developments in the Mother Country in the person of W. Strickland. This occurred about 1825.

Mixtures of charcoal and coke were tried, and in 1835 in Pennsylvania a premium of a gold medal was offered to the person who would manufacture in the United States the greatest quantity of iron from the ore during the year, using no other fuel than bituminous coal or coke, the quantity to be not less than 20 tons. Results were not satisfactory, probably due to the poor quality of the coke, possibly through selecting a poor coking coal, or in the method of blast furnace practice.

Not until 1856 was its use augmented to any great extent, but at this time there were established in Pennsylvania alone 21 furnaces in blast on coke. A gradual increase in its successful use was made during the period from the use of Connellsville coke up to the year 1880. At this point the growth was extremely rapid, and its effect of increasing the iron output of the world most vital.

Methods of Manufacture.—Coal was first coked in heaps or mounds in the open air, this being a copy of the charcoal burners, and although resulting in a first class quality of coke was an extremely wasteful method of production. It consisted in arranging rectangular heaps or mounds with longitudinal, transverse and vertical flues to obtain a draft, sufficient wood having been distributed in the mass to produce ignition. The mound was ignited and the fire allowed to spread to the whole mass. After the gaseous matters had been expelled, which was determined by experience and controlled by the flame, the mound was partially smothered by fine coal dust, the final operation consisting of the application of a small quantity of water, which permeated the whole mass. The application of the water tended to develop a coke with few cells, and under proper management a low moisture. The yield of coke was in the neighborhood of 55 to 60 per cent, the loss being 40 to 45 per cent of the coal.

The second advance in manufacture was that of inclosing the mound in a furnace, thus utilizing to some extent the heat passing off from the coal. This form of manufacture was termed the "Bee Hive Oven," and finally resulted in having a series of ovens, utilizing the

¹ "Gluckauf," 1905, p. 876.

¹ 'De Gensanne, Traite de la fonte des mines par le feu du charbon de terre.' Paris 1770, Vol .II. p. 21).

Durre, 'Den Neuren Koksofen,' p. 54.

COKE

heat on three sides of the oven and the heat of the escaping gases, to assist in coking. There was also a development in this form of oven which endeavored to throw down the solid constituents of the escaping gas in the form of tar, but the methods were, comparatively speaking, very crude, and resulted in saving but little of the 40 per cent unaccounted for.

About 1881-1882 two forms of ovens appeared, which, since that date, have been developed to such an extent that but 10 to 15 per cent of the calorific efficiency of the coal is lost. In America to-day there are two standard types of ovens, the bee hive and the by-product, both of which will be explained more in detail a little later.

Chemical and Physical Qualities.—These two qualities of the coke do not seem to hold much of any relation to each other—that is, the coke may have a fairly good analysis, and yet, if its physical qualities were below the standard, it would be useless for the metallurgist.

As to the theoretical reason for the coking of the coal, there are several theories, and that held by M. Lemoine is presented but the question is still very much undecided. Lemoine comes to the conclusion that there is a substance which he calls "Carbene," which determines the coking quality of coals. This substance he claims resembles a "fat coal." It is black, solid, friable, with a tendency towards crystallization, and is of the formula $C_{22}H_{14}O_5$.

Carbene, he says, has the property of adhering to solid bodies and spreading itself over their surface to an extent which is unknown in any other body. When a large amount of coal is subjected to distillation, as in a coke oven, the carbene may be driven from one part of the heated coal to settle itself upon the cooler portion of the mass, and thus to increase the agglutination of this part. This process may continue throughout the entire thickness of the mass until the coke is formed.

M. Lemoine claims that laboratory experiments have shown the possibility of transforming a non-coking coal into a good coking coal by means of the addition of 2 per cent of carbene. In one coal tested, which had 10 per cent volatile, the yield was 93 per cent. In conclusion, he claims we may therefore hope to produce good coke from coals which have hitherto been considered non-coking coals, and further experiments in this direction are being carried on.

The physical characteristics of a coke are of far greater importance than its chemical characteristics. Hardness is exceedingly important, and porosity is of the greatest importance. Certain coals in the coking operation, in giving off their volatile ingredients, produce in the viscous mass a greater amount of cellular structure than others. According to Fulton, good coke has a hardness of body of two to three. Condensed coke does not mean great hardness, but, on the other hand, means softness.

An important point which goes to prove the extreme adaptability of coke in blast furnace and lime kiln practice is the fact that, due to its cellular condition or porosity, the heat can be more readily prepared for combustion, and con-

sequently after it has in its descent reached the zone of combustion it is in the most perfect state possible for such action, and yet, due to its hardness, it has held its form and sustained the immense mass above it without being crushed, thereby allowing the highest per cent efficiency for blast.

Another consideration is that in equal quantities of anthracite coal and coke from the calorific point of view, the mass or volume of space occupied by coke is much greater than that of coal; hence, it can distribute its heat to a greater mass of burden than the coal and avoid that concentration of an excessive heat applied at one point when using anthracite coal in order to obtain the heat necessary for the action throughout the mass.

Economical and Commercial Consideration of Coke Manufacture.—These features of the consideration should not be considered independently. As stated previously, the waste product from the bee-hive method of producing coke to-day is enormous; not alone is part of the coal utilized in the coking operation, but all the gases and volatile matters passing out of the furnace contain material of immense value.

The construction of the by-product oven of to-day requires in its management a large amount of chemical and metallurgical skill. The problem of marketing the by-products is an important one and requires great familiarity with the arts of manufactures into which the by-product enters, since it is only by the preservation of these markets and the maintenance of fair prices for the products that the continued growth of the by-product oven is possible. A most conservative policy is essential to the industry. This is especially the case on account of the peculiar conditions surrounding the tar market, for from one ton of coal 60 to 100 pounds of tar is produced. There are great fluctuations in the supply of and demand for tar, and in case of an over supply there is no resource but to burn it as fuel. Moreover, there are relatively few industries in which tar can be disposed of in large quantities, especially in the United States, at the present time.

Among the industries for its utilization are the following: The saturation of paper or felt with tar for roofing purposes is an industry of considerable importance. As a fuel in combustion engines, by-product tar may be used as successfully as petroleum oil. Upon the products of the distillation of tar various industries are dependent. The utilization of pitch in the manufacture of briquettes is comparatively new in this country, but is destined to become of great importance, particularly in working up into valuable form the anthracite culm piles of Pennsylvania and the breeze of coke plants.

Plants have recently been installed in Scranton, Detroit and Montreal for the manufacture of briquettes. Tar macadam roads, made with regular foundation and an upper layer of three inches of a mixture of fine spawls and a certain grade of pitch, make a pavement perfectly impervious to moisture.

The distillate from tar has many uses, the most common being the well-known one of creosoting railroad ties. Railroad men are convinced, from long continued experience, that

COKE

no other method of treating ties to preserve them is as satisfactory as creosoting with coal tar distillate which must have a high content of naphthalene. Large quantities are used for making lampblack. As the consumption of pitch for briquetting purposes increases, which requires the distillation at a high temperature, anthracene will be produced in large quantities and will be shipped to Europe for alizarine manufacture.

Another branch of the by-product industry is the recovery of aromatic oils from the gases. Of the 10,000 cubic feet of gas produced from a ton of coal, 6,500 cubic feet are required in the coking process. This gas contains on an average 0.75 per cent of benzene and its homologues. The heat value of this gas is affected only slightly by the removal of the benzene. By washing gas with petroleum or coal tar oil, a benzolized oil containing 2 to 3 per cent of benzene is produced, and by distillation of crude benzene, light oil is obtained.

Only slight quantities of impurities, carbon disulphide, hydrogen sulphide, thiophene and naphthalene are found to be present, and purification and redistillation furnish a benzene 100 per cent pure, and suitable for nitrifying and converting aniline.

From the oil which is with the pitch (the result of the distillation of crude coal tar) is obtained anthracene. From creosote oil are obtained naphthalene, carbolic acid, and other homologues. Carbolic acid is the base of picric acid, which is the main ingredient of the latest high explosives, as English Lyddite, French Malenite, the Japanese Shimose powder, and our own Maximite. Carbolic acid, as is well known, is used very largely as a disinfectant. Yet all these uses thus far developed in this country will not consume any important part of the country's production of tar, or offer any material relief to the responsibility of those interested in the uses of tar products. So America must continue to look across the water for the supply of most of these articles until there have been many failures and much time and money expended in experimenting.

The by-product ovens are the leading producers of ammonia in the country, and this crude product forms the raw material for refined ammonia products, and also furnishes a supply for the manufacture of soda by the ammonia process. Ammonia is also being used for the manufacture of explosives, and for the production of the refined aqua ammonia which is largely consumed in refrigerator machines, either as aqua ammonia or anhydrous ammonia. Sulphate of ammonia, which forms the main ammonia product of the German coke oven, is still being imported into this country, although the production of sulphate from the by-products of coke ovens here is rapidly increasing. This form of ammonia is, of course, mainly consumed in the manufacture of fertilizer. The consumption of fertilizer is growing in this country, especially in the South, and it has been demonstrated many times in Continental Europe, where the subject has been studied, that sulphate of ammonia is the most valuable form of nitrogen or plant food that is on the market. Commercially speaking, therefore, the by-product oven cannot have a healthier growth

than is justified by the industries that consume its by-products.

The Bee-Hive Oven.—The type of this oven is as shown in the sketch. It is 12 to 13 feet in diameter, with a 7 to 8 feet height of dome above floor level, lined with silicious brick backed with concrete or masonry. The charging hole is on top, and the oven door slightly higher than the level of the charge, in order to avoid waste.

Various systems have been established to utilize the waste gases and heat of the coking operation, either by surrounding the furnace with ducts, or utilizing the heat in an adjoining plant. All these steps in the progress of development tend toward the by-product oven, but more particularly is it true when it is the aim to save the by-products.

At the close of 1905, practically 89 per cent of the coke in the United States was manufactured in Bee-Hive ovens, due to the non-available market for the by-products, and the lack of supply of good coking coals. The cost of erecting a Bee-Hive oven is very small in comparison with that of a by-product oven, hence the commercial policy of replacing the Bee-Hive oven with a by-product oven as fast as the market conditions demand the by-products.

The By-product Coke Oven.—A plant of one hundred ovens has been taken for explanation as applying the principles underlying by-product oven practice to-day in the United States.

The ovens are arranged in two groups or batteries of 50 ovens each. Each oven is an air tight retort, consisting of a rectangular chamber 43 feet 6 inches long, 17 inches wide, and 6 feet 6 inches high. The ovens are placed side by side, and are supported on a steel structure, consisting of light I-beams, running the length of the battery, which rest on cross girders supported by steel columns. The construction allows the brick work to be inspected at all points. The primary object, however, is the uniform distribution of fuel gas to the combustion chambers for heating the oven retorts. The retorts are separated by hollow walls, which are divided into 10 compartments, each compartment containing 4, preferably vertical, flues. Alongside this chamber, and directly under the vertical flues above referred to, are 10 combustion chambers. The gas supply to each of the chambers is controlled independently, and a uniform heat is maintained throughout the entire length of the oven. The air for combustion is admitted through an opening in the wall between the air and combustion chambers. The air is heated to 1,800 degrees F. by a pair of regenerators, placed together under the centre of the battery and running its entire length. A vertical flue conducts the air from the regenerator to the air-chamber under the oven.

The well known Siemens principle is used in operating the air regenerators, with reversals every 30 minutes. The fuel gas is reversed at the same time as the air by means of a suitable valve; but the gas is not regenerated. The gas unites with the hot air in five combustion chambers, ascends through the vertical flues to a horizontal flue above, through which it passes and descends through the five chambers in the

COKE

other end of the oven, hence through the air chamber and vertical flue connection to the regenerator, and through the reversing valves to the stack. The regenerators are built entirely independent of the oven structure, so that their expansion does not affect the oven brickwork.

Coal Handling.—A steel coal storage bin of a capacity equivalent to about two days coal consumption is placed between the batteries. The coal is elevated to the bin from a hopper placed under the coal receiving track, by a belt or other type of conveyor. A coal larry of 8 tons capacity runs on a track on the top of the batteries and under the coal bin. The larry consists of a long narrow bin with 8 spouts in the bottom, through which the coal is run into the oven retort through holes in the top of it, and is leveled by means of a bar worked through a small opening in the doors at the ends of the oven. The larry is operated by an electric motor and receives its load of coal from the storage bin, under which it passes. A very dense metallurgical coke can be produced, and the output of an oven largely increased by compressing the coal into a mold slightly smaller than the retort and charging the mass through the oven door.

Coke Handling.—Upon the completion of the coking process, the oven doors are raised, and the mass of 6 tons of coke is pushed upon a movable platform by means of a ram. The pushing ram, as well as the machine on which it is mounted, are operated by electric motors. The coke after being pushed upon the platform, is quenched and allowed to cool. The platform is then tilted by an electric motor, and the coke slides off into cars, which run on a track at the back of the machine.

Gas Mains.—The gas distilled from the coal during the coking process is conducted to the condensing house by two independent systems of mains. These mains run on top of the battery the entire length—one on each side. Each oven is connected to each main by a vertical pipe and valve. During the first part of the process, the rich gas is taken off through the rich gas main. The valve to this main is then closed and the balance of the gas is taken off through the poor gas main. When the coking is completed, the valve to the poor gas main is closed, disconnecting the oven from both mains.

Condensing Plant.—The gas leaving the coke ovens is divided into two fractions, viz., the first fraction of "rich" gas, which is sent out as illuminating gas, and the second fraction or "poor" gas, which is used for heating the ovens. The cooling of the gas and the removal of the tar and ammonia are done in the usual apparatus, hence it is not necessary to discuss it here in detail. Both the rich and poor gases are treated in the same manner.

The rich gas when freed of tar and ammonia leaves the condensing plant and passes into the purifying plant, and from there into a large gas holder for illuminating gas, from which it goes into the city. The poor gas, after being treated in the same manner as the rich gas, leaves the ammonia washers and passes through two benzol scrubbers. Here it is mixed with producer gas, when necessary, and carried to the ovens for heating. The benzol extracted from the poor gas is then transferred to the rich gas, so as to increase its candle power.

The tar oil by which the gas is washed, runs first from a tank through the second benzol scrubber into another tank. From here it is supplied by a pump into the first benzol scrubber. The tar-oil enters the tank with about 5 per cent of benzol, and finally leaves the washer with about 15 per cent of benzol. It is collected in another tank. From here it is fed by a pump into a still, in which the benzol is reduced again to about 5 per cent. The exhausted oil collects in another tank. From here it is taken by a pump through the oil cooler in order to be again supplied to a tank for a new absorption.

A small additional plant is needed, by which a small percentage of the oil is revived, in order to keep it active for benzol absorption. This consists of a simple tar still and condenser, in which the tar-oil is freed from most of the naphthalene and other hydrocarbons incidentally absorbed. The presence of an excessive percentage of them in the tar-oil would interfere with a complete benzol absorption.

The benzol vapors which are driven off in the still are carried into the rich gas system by means of a gas current coming from the pressure side of the rich gas condensing plant. This greatly facilitates the distillation of tar-oil passing through the still. The mixture of the gas and benzol vapors then passes through a pipe, preferably to the inlet of the exhausters of the rich gas condensing plant. In this manner, the vapors do not come in contact with a large body of tar, which would be liable to absorb a part of the benzol. It is unnecessary to describe here the details of the benzol distilling plant. A great number of these are in operation in connection with German by-product plants.

Coke Oven Brick.—Under construction the principal feature of an oven is in the brick used. What is termed silica brick is now being used, and probably will be the standard coke oven brick of the future. It has been determined that the fusing point of a silica-alumina brick reaches the lowest temperature at 60 per cent silica and 40 per cent alumina, but if the silica is increased up to say 90 per cent., an infusible brick of the highest quality is the result.

For all classes of work, a good high grade plastic No. 2 fire clay, with possibly a small amount of flint clay, should be used. This will make a creamy, sticky slip, which will make an excellent joint. The joints are always weak spots, and are therefore a necessary evil. The brick should always be dipped into the mortar, which should be of the consistency of cream, and rubbed on each other to make a good tight contact.

Coking Coals.—There are three principal coal area sections in the United States supplying good coking coal. The Connellsville section in Pennsylvania was the first developed, and it is reported that this supply is fast disappearing. The second section is that of the Pocahontas Field in West Virginia, and the third is in Colorado. As the good coking coal fields disappear, so will the by-product ovens come into use, for it is possible to coke a coal in a by-product oven that it is practically impossible to coke in the Bee-hive type.

Exportation of Coke.—The value of coke

COLA-NUT—COLBERT

exported from the United States in 1905 amounted to \$20,000,000, while that of coal was about \$11,000,000. A large part of this went to British North America. The output of coke in 1904 was 23,661,106 short tons. The value of this coke was \$46,144,941, or an average price of \$1.95. The output of coke for 1905 was 32,231,129 tons, the value being \$72,476,196, the average price being \$2. The increase in number of coking plants during the year 1905 was twelve, numbering 3,968 ovens. Of these, 64 per cent were in Pennsylvania, 10 per cent in West Virginia, and 8 per cent in Alabama.

The writer wishes to express his appreciation of the writings of Dr. F. Schneiwind, Mr. J. D. Pennock, Mr. John Fulton, Mr. W. H. Blauvelt, and Mr. C. G. Atwater, from whom he has quoted direct parts of the preceding paper.

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Co'la-nut, the seed of a tree (*Cola acuminata*) from 20 to 30 feet in height, belonging to the natural order (*Sterculiaceæ*), whose habitat is a region of west Africa stretching 500 miles from the coast into the interior, between Sierra Leone and Lower Guinea. The tree has become naturalized in the West Indies and Brazil. It bears a profusion of purplish flowers. The flower yields a large brownish-yellow fruit, which enfolds in the same follicle the red and white seeds called cola-nuts. In its tenth year the tree reaches its greatest fecundity, and then yields 120 pounds of seeds. They are gathered in October and November from a June flowering, and again in May and June from a December flowering. In the tropics the natives use the cola-nut as a stimulant and for medicinal purposes, and only recently has the nut passed from the narrow use of the aborigines into an extensive service of civilized man. An analysis of it shows that it contains nearly all the constituents of coffee, tea, and cocoa, and other constituents not possessed by them.

Colberg, or **Kolberg**, Prussia, seaport and watering-place in the province of Pomerania, on the Persante, near its mouth, 170 miles north-northeast of Berlin. It stands on a hill, surrounded with three suburbs. The principal

church dates from 1316. In 1102 Duke Boleslaus of Poland vainly besieged Colberg, which endured long sieges in the Thirty Years' war, in the Seven Years' war, and again in 1807, when it was most gallantly defended against the French. Colberg has manufactures of woolens, agricultural machines, and spirits; and salmon and lamprey fisheries. Pop. 18,622.

Colbert, Jean Baptiste, zhõñ bāp-tēst kōl'-bār, French statesman and financier; b. Rheims, 29 Aug. 1619; d. Paris 6 Sept. 1683. He entered in 1648 the service of Cardinal Mazarin, who availed himself of his assistance in the financial administration of the kingdom. Mazarin rewarded him in 1654 with the office of secretary to the queen, and recommended him to the king at his death in 1660. Louis XIV. made Colbert intendant of the finances. His task was to remedy the evils which the feeble and stormy reign of Louis XIII., the splendid but arbitrary measures of Richelieu, the troubles of the Fronde, and the confused state of the finances under Mazarin, had occasioned. He found fraud, disorder, and corruption prevailing everywhere. The domains were alienated. Burdens, privileges, and exemptions were multiplied without measure; the state was the prey of the farmers-general, and at the same time maintained only by their aid. The revenues were anticipated for two years, and the treasury empty. He began with establishing a council of finances and a chamber of justice. For the purpose of alleviating the public burdens he endeavored to lower the interest of the public debt; and in order to mitigate the odium of this measure consented to a considerable diminution of the taxes, and the remission of all arrears up to 1656. He abolished many useless offices, retracted burdensome privileges, diminished salaries, and by a better distribution and collection of the taxes was able to reduce them almost one half. Notwithstanding the expenses of nearly 10 years' war, and the prodigality of a luxurious king, Colbert succeeded in 22 years in adding to the revenues more than 28,000,000 livres, and making an equal diminution in the public burdens; and at his death in 1683 the revenue actually received amounted to 116,000,000. To his talents, activity, and enlarged views the development and rapid progress of industry and commerce in France were largely due. He constructed the Canal of Languedoc; formed the plan of that of Burgundy; granted premiums on goods exported and imported; regulated tolls; established insurance offices; made uniform laws for the regulation of commerce. Naval schools were established, and order was introduced into all branches of the marine. By the advice of Colbert Louis XIV. caused the civil and criminal legislation to be improved, and the arts and sciences encouraged. Under the protection and in the house of the minister (1663) the Academy of Inscriptions was founded. Three years afterward he founded the Academy of Sciences, and in 1671 the Academy of Architecture. The Academy of Painting received a new organization. He enlarged the Royal Library and the Garden of Plants, and built an observatory in which he employed Huyghens and Cassini. He began the measurements of the meridian in France, and sent men of science to Cayenne.

COLBURN — COLCHICUM

After having conferred the greatest benefits on his country he died, out of favor with the king, and dreading the exhaustion of the treasury by the new war Louis was resolved upon making against Holland. See Gourdautt, 'Colbert, Ministre de Louis XIV.'

Colburn, kōl'bĕrn, Warren, American mathematician: b. Dedham, Mass., 1 March 1793; d. Lowell, Mass., 13 Sept. 1833. He at first worked at a machinist's trade, but developed a taste for mathematics, and graduated at Harvard 1820. He devised important improvements in machinery, and for many years was a popular lecturer on the sciences. He is best known for his 'First Lessons in Intellectual Arithmetic' (Bost. 1821) which he had planned while a student at Harvard. He also published a 'Sequel' to the arithmetic (rev. ed. 1833), and an 'Algebra' (1827).

Colburn, Zerah, American mathematician: b. Cabot, Vt., 1 Sept. 1804; d. Norwich, Vt., 2 March 1840. Before his sixth year he began to manifest wonderful powers of arithmetical computation. In 1812 he was taken to London, and after traveling over England, Scotland, and Ireland, went to Paris. Returning to London in 1816, he was placed by the Earl of Bristol in Westminster School, where he studied for three years. He lost his father in 1824, and returned to America, where he was employed again in teaching. In 1825 he became connected with the Methodist Church, and after nine years' service as an itinerant preacher settled in Norwich, Vt. He was professor of languages in the university of that town till his death.

Colburn, Zerah, American engineer: b. Saratoga, N. Y., 1832; d. Massachusetts 4 May 1870. After working on a farm in New Hampshire, he went to Boston and worked in the Lowell machine-shop, and on the Concord Railroad. He became superintendent of some locomotive works in Boston, and later occupied a similar position in Paterson, N. J. In 1854, he started an engineering journal in New York, known as the 'Railroad Advocate,' and for this journal wrote a series of papers on machine and locomotive works in France and England, the result of his investigations while on a trip abroad. He again visited Europe in 1857, and in 1858 began writing for the London 'Engineer,' of which he shortly became editor. At one time he returned to the United States for a few months, and started the Philadelphia 'Engineer,' but gave up that enterprise, and resumed the editorship of the London journal till 1866. He then began the publication of 'Engineering' in London, but in 1870, when he became partially insane, he returned to the United States, where he finally committed suicide. He wrote 'The Locomotive Engine' (1851), and a number of valuable technical papers.

Colby, Frank Moore, American writer: b. Washington, D. C., 10 Feb. 1865. He graduated at Columbia University 1888, and took graduate studies in political science there. He taught history at Amherst College 1890-1; was lecturer in history at Columbia 1891-5; professor of economics in New York University 1895-1900, when he became an editorial writer on the *Commercial Advertiser*. He has done a large amount of editorial work on Johnson's 'Cyclopædia'; the 'International Cyclopædia,' and 'International Year Book,' editing the latter since its founda-

tion in 1898, and was the managing editor of the 'New International Cyclopædia' (1902-3).

Colby College, a coeducational institution in Waterville, Me.; founded in 1818, under the auspices of the Baptist Church. After the first year's work, the courses are nearly all elective. The average number of students, each year, is 200. In the library are 37,900 bound volumes and about 21,000 pamphlets. The college is endowed about \$500,000, and the property is valued at \$254,000.

Colchester, kōl'chĕs-tĕr, England, a borough and river port of Essex, on the Colne, 50 miles northeast of London. It is partially encircled by a wall built during the Roman period, and among relics of the past it contains a castle whose enormously thick walls date from the time of William Rufus, a picturesque, ivy-grown ruin of Saint Botolph's priory, while in the Church of the Holy Trinity is a Saxon doorway. The most important modern structure is the spacious and handsome Town Hall, completed in 1902. Colchester was known to the early Britons and the Romans as Camulodunum, and to the Saxons as Colneceaster. It has a large oyster-fishing trade, and exports of corn and malt. In 1648 Colchester stood a memorable siege of 11 weeks against the Parliamentary forces, who eventually starved out the royalist garrison and hung the leaders. See Cutts, 'Colchester' in 'Historic Town Series' (1889).

Col'chicine, a vegetable alkaloid obtained from plants of the genus *Colchicum* (principally from the roots and seeds) by successive extraction with hot alcohol, water, and chloroform, and subsequent repeated crystallization from all three of these solvents. It is a yellowish-white powder, with the probable formula $C_{22}H_{23}NO_6$. It acts as a weak base, but most of its compounds are decomposed by water. Preparations of colchicine are used in medicine for the treatment of gout. It is very actively poisonous, half a grain having proved fatal.

Colchicum, kōl'chĭ-kŭm, a genus of herbs of the natural order *Liliaceæ*. About 30 species, natives of the Mediterranean region, have been described. They are nearly all autumn-blooming perennial plants which produce their leaves in spring from corms. The perianth, which resembles but is much larger than that of the crocus, is long and tubular, and varies in color from white to purple (in one species yellow). The leaves, which are broad and long in proportion to the size of the plants, die in early summer, and the flowers appear when nature is preparing for the winter. For this reason the autumn-blooming species are very popular in gardens. They are of easiest culture, the bulbs being planted in late summer and protected in severe climates with a winter mulch of litter or straw, which is removed in the spring. Beds once planted will need no further attention for several years, when they should be dug up, the corms divided and set in fresh soil in a sunny situation. The plants of some species are very acrid and are reputed poisonous, and when cattle have access to them are said to produce injuries of various kinds. Ordinary clean cultivation will soon rid any land of the plants. The corms and the seeds have been used in medicine for gout and rheumatism. *C. autumnale*, the best-known species, is popularly known as mea-

now saffron and autumn crocus, names also given to other species.

In medicine the corm and seeds of *Colchicum autumnale* are used, in which the active principle is found in from .3 to .5 per cent. *Colchicum* has in medicine but one use; that is, in attacks of acute gout. These it cuts short, relieving the pain and shortening the attack better than any other drug. The reasons why are at present unknown, and the remedy is one of the few now remaining in modern medicine that are still used on empirical grounds only. Poisoning by this drug is not uncommon. The symptoms are those of an acrid gastro-enteric poison, with great pain, nausea, vomiting, and diarrhoea. There is marked depression of the pulse and of the respiration, and death is due to shock and collapse. Washing of the stomach is the first indication for treatment, notwithstanding the self-conservative vomiting. Castor oil, heat, alcohol, and mucilaginous drinks are indicated.

Colchis, kōl'kīs, or **Colchos**, the ancient name of a region at the eastern extremity of the Black Sea, resting on the Caucasus, and corresponding partly to Mingrelia. It is famous in Greek mythology as being the destination of the Argonauts. The people were celebrated for frugality and industry, and from their dark complexion, crispy hair, language, and customs, Herodotus is of opinion that they were of Egyptian origin. The country abounded, according to Strabo, in all kinds of fruits and material for ship-building. Linen was an important branch of manufacture, and wool of fine quality and in great quantity was produced. It was fruitful in poisonous herbs. In the 15th century it was subdivided into several principalities, and is now comprised in the Russian government of Trans-Caucasus.

Col'cothar, red oxide of iron, ferric oxide, Fe_2O_3 . The reddish-brown powder that remains in the retorts when ferrous sulphate is distilled in the manufacture of Nordhausen sulphuric acid. It is used for polishing glass, and also as a pigment, under the name of "Indian red." When in the finest state of subdivision it is known as "rouge," and is much used for fine polishing by jewelers and others. Colcothar was the *caput mortuum vitrioli* of the alchemists.

Cold. 1. In physics and physiology, a relative want of heat. Since there are no determinate boundaries between cold and heat, it is a mere arbitrary distinction to call the degrees of the thermometer below the freezing-point degrees of cold. When the atmosphere, or any substance which comes in contact with the body, is at a lower temperature than the skin, it absorbs heat from the body, and is called cold. The physiological action of cold on the animal organism requires a brief notice. All animals (the warm-blooded animals to the greatest extent) have a certain power of maintaining the heat of the body in defiance of external cold. This power is mainly due to a process analogous to combustion, in which carbon and hydrogen taken into the system in food are made to unite with oxygen derived from the air by respiration. If the combustible materials are not duly furnished, or if the supply of oxygen be deficient (as in various diseased conditions), there must be a depression of temperature. Now, if the temperature of a bird or mammal (except in the case of hibernating animals) be lowered

about 30° below its normal standard (which in birds ranges from 100 to 112° , and in mammals from 96° to 102°), the death of the animal is the result. The symptoms indicating that an animal or a man is suffering from a depression of the temperature of the body are: (1) retardation of the circulation of the blood, causing lividity of the skin, which is followed by pallor, in consequence of the blood being almost entirely driven from the surface through the contracting of the vessels; (2) a peculiar torpor of the muscular and nervous systems at the same time, manifesting itself in an indisposition to make any effort or exertion, and in intense sleepiness. The respiratory movements become slower and the loss of heat goes on, therefore, with increasing rapidity, till the fatal limit is reached and death supervenes. In hibernating animals (the marmot, dormouse, bat, etc.) the power of generating heat within their own bodies is very slight, their temperature following that of the external air, so that it may be brought down nearly to the freezing-point. Great or prolonged atmospheric cold is a most powerful depressing agent, and is a fruitful cause of disease and even of death. Whenever the temperature of the atmosphere is suddenly reduced, and particularly when it is reduced below the freezing-point, a considerable addition takes place to the mortality of the region. The effects of cold are, in ordinary circumstances, most apparent among the aged and the very young, and among those suffering from chronic disease.

2. In medicine, cold, as well as heat, is frequently employed for its therapeutic value. Cold is one of the most valuable means of obtaining lowered temperature. Cold sponging, ice-packs, alcohol evaporation, are useful in most fevers, are indispensable in sunstroke, and very refreshing in minor indispositions. Cold applied to an inflamed area diminishes the blood-tension by contracting the blood-vessels, and thus tends to limit inflammation. Cold applied to the skin, as by a wet pack, or as a shower, is a tonic, increasing metabolism, augmenting the appetite and giving mental and physical vigor. Cold applied as iced drinks, or cracked ice itself, is one of the best agents in nausea and gastric distress. Cold by means of ether or ethyl chloride spray is an excellent local anæsthetic for the treatment of local boils, felons, ulcers, etc., and is also used frequently in the extraction of teeth.

Catching cold is a term of wide popular use, and signifies an affection which is little treated of in medical literature, although an affection widespread and unpleasant. Catching cold is a process of disturbed equilibrium of the blood vessels. It is usually due to excessive evaporation from the skin caused by drafts of air, to which is added contraction of the blood vessels of the periphery of the body, with consequent engorgement and congestion in some internal organ. Keeping quiet, taking hot foot-baths, or hot drinks, sweating, etc., are measures that tend to bring the blood to the contracted areas, and away from the congested areas, with consequent good results. If, however, the disturbance becomes marked, if the exposure has been excessive, the congestion in an area becomes so serious that its local functions are diminished or aborted, and the congested blood vessels may be over-distended and paralysis result. Then an inflammatory reaction may ensue; the reduced

COLD CREAM — COLD HARBOR

vitality of the part encourages the multiplication of ever-ready bacteria, and an acute diseased process may result. It may be a simple acute inflammation of the kidney; or if the pneumococcus is present in the lung, a pneumonia; or it may be a bronchitis. Taking cold is therefore a distinct process that predisposes to more severe affections. In most cases the secondary reaction of taking cold manifests itself in the mucous membranes of the air-passages, and running from the nose, some degree of cough, general malaise, languor, and muscular and joint pains are the results. Secondary infection, frequently through the superimposed influenza bacillus (if the condition be not primarily induced by that organism), results in the "grippe," following which bronchitis and pneumonia are very frequent.

No cold in the head, no general cold, should be neglected. Rest in bed, cathartics, hot drinks, and medical advice are desirable.

Cold Cream, a cooling ointment made by melting four ounces of white wax in one pound of almond oil by means of a gentle heat. Then mix gradually with a pint of rose-water in a warm mortar. Another recipe is: Take two parts of spermaceti, two parts of white wax, and three parts of almond oil; melt together, and then add rose-water as before. This ointment cools the skin, rendering it soft and pliable, and is successfully applied for the cure of chapped hands.

Cold Harbor, Battle of. By a series of bloody assaults and flank movements, beginning at the Wilderness 5 May 1864, Gen. Grant had, at the end of the month, forced Gen. Lee back to within a few miles of Richmond, and confronted him on the line of the Totopotomoy. On 31 May his army was along the road from near Hanover Court-House to Cold Harbor; the Sixth corps about six miles southeast of the court-house; to its left, in the order named, the Second, Ninth, and Fifth corps, these near Bethesda Church. The Eighteenth corps was at White House, on the Pamunkey, where it had just arrived from the Army of the James. Gen. J. H. Wilson's cavalry division was on the right of Grant's line, and Sheridan, with the two cavalry divisions of Torbert and Gregg, on the left. On the 31st Sheridan, after a severe fight, occupied Cold Harbor, but was so hard pressed by the Confederate cavalry division of Fitzhugh Lee and Clingman's brigade of infantry, and his position so exposed, that he fell back at night; but receiving an order from Gen. Meade that the place must be held at all hazards, he returned, and during the night entrenched. Lee's position was so strongly entrenched and so difficult of access that Grant determined again to extend by his left on Lee's right, and in view of this extension Cold Harbor was an important point, as there the roads concentrated from Bethesda Church, Old Church, White House, New Bridge, and all the bridges across the Chickahominy above and below New Bridge. Grant extended in that direction by transferring from his right. At 11.45 on the night of 31 May, Gen. H. G. Wright's Sixth corps was ordered from its position on the right to march along the rear of the army to Cold Harbor, 15 miles distant, and to be there by daylight on 1 June to support Sheridan, who, it was believed, would be heavily attacked at daybreak; but it

was nine o'clock before he arrived, and Sheridan meanwhile had repulsed two determined attacks of Kershaw's division. At 3 P.M. 31 May the Eighteenth corps, Gen. W. F. Smith, was ordered by Gen. Grant to march from White House and form on the right of the Sixth. By a mistake in the order given it, it was late in the afternoon of 1 June when it reached its position. Opposing the two corps were the Confederate divisions of Gens. Hoke, Kershaw, Pickett, and Field, their main entrenched line about 1,400 yards distant; the interval between mostly open ground. About 300 to 400 yards in advance of the main line was a line of rifle-pits. It was necessary to take this position before Gen. Lee could concentrate on that flank and thus cover this road to Richmond. Between 5 and 6 P.M. Wright and Smith assaulted, and under heavy artillery and musketry fire Smith carried the advanced Confederate works and held them, taking many prisoners. Wright carried the advanced line and, breaking the left of Hoke and right of Kershaw, took parts of the main line, some of which he held, the Confederates falling back to a new line. The loss in the two assaulting corps was about 2,200. On the night of the 1st Sheridan had been ordered to attack on Wright's left, but received the order too late to execute it. On the morning of the 2d he advanced Gregg's division to Sumner's Bridge, on the Chickahominy, attacked a force of infantry, cavalry, and artillery, posted near the bridge, carried their advanced position, and held it until Hancock's corps arrived. Hancock's Second corps moved after dark of the 1st from the extreme right, under Meade's order to march with all speed, join Wright by daybreak of the 2d, and take position on his left, extending the line if possible to the Chickahominy. By an error of Hancock's engineer a wrong road was taken, and it was after seven o'clock when his head of column arrived; then under heavy skirmishing he formed line across the road from Cold Harbor to Dispatch Station. It had been the intention to attack the Confederate line early in the morning. Smith declared that the idea "was simply preposterous." Hancock's men were in an exhausted condition, and the attack was suspended until 5 P.M., and then deferred until 4:30 A.M. 3 June. At this time Grant's line was held on the right by Gen. J. H. Wilson's cavalry from the Pamunkey to Bethesda Church; Warren's Fifth corps, which had not moved, stretched from Bethesda Church about three miles to Beulah Church. Burnside's Ninth corps had been ordered to withdraw from the extreme right and form in Warren's rear to support his right. The Eighteenth corps was on the left of the Fifth, a wide interval between them; the Sixth and Second corps were on the left of the Eighteenth. Lee had observed that Grant was transferring the right of his army, by successive movements, to the left, and not proposing that Grant should take the initiative in attack, took it himself. On the morning of 2 June he ordered Early with three divisions to attack Grant's right flank and drive it down in front of the Confederate line. Early found Burnside in the act of withdrawing from near Sydnor's Mill, to take position in Warren's rear, attacked and captured the skirmish line, which had been left in the works, and fell upon his rear division, by which, with the assistance of the other divisions, Early was checked, but not before he had got in the

COLD SPRING HARBOR — COLD STORAGE

rear of a part of Warren's skirmish line, from which he took many prisoners. Warren repulsed Rode's division, which had attacked his front, and at night both sides entrenched. The Union losses 1 and 2 June were over 5,000 killed and wounded. Meanwhile Lee closed in to the right and formed his lines in front of Grant's left, his right on the Chickahominy, near Alexander's Bridge, his left extending a little west of north in the direction of the Totopotomoy. A. P. Hill's corps was on the right; Longstreet's, commanded by R. H. Anderson, in the centre; and Early's on the left, cavalry covering both flanks of the infantry. The line included the ground on which was fought the battle of Gaines' Mill, June 1862, and covered all the main roads to Richmond, being about six miles from the main exterior fortifications of the city and but half that distance from its most advanced works. Grant's whole line, except the cavalry on the left, was ordered to assault Lee's lines at 4.30 A.M. 3 June. Wilson, re-enforced by 2,000 cavalry and 3,000 infantry, was ordered from Hanover Court-House to Hawes' Shop to attack Early's left and rear. The main work was to be done by the Second, Sixth, and Eighteenth corps, supported by the Fifth and Ninth. No reconnaissance had been made in front, where the Confederate works were so constructed as to give a cross-fire upon assaulting columns. At the signal the assault was made at 4.30 A.M. On the left Barlow's and Gibbons' divisions of the Second corps leaped their works and, under a severe fire of artillery and musketry, drove in the enemy's advanced line and in many places gained the main line, but the latter was soon retaken and in 20 minutes from the time the signal was given the Second corps was repulsed with a loss of 3,000 men, including many of its most promising officers, who were killed on the works. The men did not retreat far, but lay down within a few yards of the Confederate works, and with bayonets, tin cups, and plates, began to entrench, skirmishing all the while. It fared no better with the Sixth corps. Its three divisions went forward, carried some advanced rifle-pits, assaulted the main line, and were met by a severe musketry fire and an enfilading artillery fire. They were repulsed with a loss of 800 killed and wounded, but gained positions at some points only 30 or 40 yards from the enemy's works, and held and entrenched them. On the right of the Sixth corps, the Eighteenth was obliged to form one division to the right to protect its flank, Martindale's and Brooks' divisions assaulted and were quickly driven back by a cross-fire of artillery and musketry, and it desisted from further effort after a loss of about 1,000 men. In less than an hour the three corps had lost nearly 5,000 in killed and wounded. Warren, on the right, reported that he could not advance unless the troops on his left advanced at the same time. Wright said that if he advanced without a corresponding advance of Smith on his right he would be taken in flank and reverse, and he was waiting for Smith and Hancock to move; and Smith said he could not move unless Wright covered his left flank. Gen. Meade ordered another assault, each corps to go forward without regard to those on the right or left, but it was not made, Hancock would not take the responsibility. Smith had all he could do in holding his own; Wright, also Hancock, merely transmitted the order to brigade and regi-

mental commanders without enforcing it; and the men opened fire from their sheltered positions, without an effort to advance. Meade gave a third order for an advance of the entire line. Smith positively refused to obey, as it meant but a wanton waste of life to attempt it. Wright and Hancock merely transmitted the order, and again the men complied with it only by renewing fire from their positions. Grant got the opinion of his corps commanders that further assault was inadvisable, and at 1.30 P.M. orders were given to entrench "with a view to moving against the enemy's works by regular approaches." Farther to the right Burnside with the Ninth corps and Warren with the Fifth, who were to support the main assault, attacked Early in the morning, occupied some of the positions taken from them on the 2d, entrenched close up to Early's main line, and were about to assault, when they received orders to suspend attack. They had fought sharply during the morning, the Fifth corps losing about 500 killed and wounded, the Ninth corps about 800. Wilson's cavalry had a sharp engagement at Hawes' Shop, driving the enemy with some loss, and attacking the left and rear of Heth's division; but failing to connect with Burnside, they withdrew to Hawes' Shop. The loss of the Army of the Potomac for the entire day of 3 June was about 7,000 killed and wounded. All night of the 3d both armies were entrenching; no pickets could be thrown out, so close were the lines, between which lay many wounded. Some of the wounded were brought in, but it was not until the 7th that a truce was agreed upon, by which all could be removed, when exposure and starvation had transferred the greater part of them to the death-roll. Regular approaches were made by the Union lines, accompanied by constant and heavy skirmishing; an assault gave no promise of success; and on the night of the 12th Grant withdrew to cross James River. Grant had 103,000 "present for duty" at Cold Harbor. His loss (1-12 June) was 1,845 killed; 9,077 wounded; 1,816 missing; an aggregate of 12,738. Lee had not to exceed 65,000 men. His loss cannot be accurately given, but probably did not exceed 2,600 killed and wounded. Gen. Grant, in his 'Personal Memoirs,' says: "I have always regretted that the last assault on Cold Harbor was ever made. No advantage whatever was gained to compensate for the heavy loss we sustained." Consult: 'Official Records,' Vol. XXXVI.; U. S. Grant, 'Personal Memoirs,' Vol. II.; F. A. Walker, 'History of the Second Army Corps'; A. A. Humphreys, 'The Virginia Campaign of 1864-5'; I. R. Pennypacker, 'Life of General Meade'; The Century Company's 'Battles and Leaders of the Civil War.'

E. A. CARMAN.

Cold Spring Harbor, N. Y., a village of Suffolk County, on Cold Spring Harbor, and on the Long Island R.R. It was formerly a whaling port. It is now a summer resort, and has a fish hatchery and a school of biology.

Cold Storage, a method now generally employed for preserving perishable articles of food by the use of machines which reduce the temperature of the air. The same method is used extensively for preserving articles other than food which are destructible by high temperature. Refrigeration is often called ice-making, but in a cold-storage building the area

COLD STORAGE

kept at a certain temperature by the frozen liquid is small compared with that kept at a proper temperature by ammonia and other substitutes for ice. Perhaps no product ever came into common use more rapidly than air treated according to the cold-storage method, unless electricity or steam be excepted. It is now indispensable in connection with some of the largest business enterprises, which, without it, would soon cease to exist. One of the most important uses of cold storage is in the transportation of beef, fruit and vegetables, etc., from place to place and from one country to another, especially from the United States and South America to Europe.

The extensive systems employed in breweries, provision depots, dairies, and distilleries have familiarized the public with the use of cold air; and no modern hotel or apartment house on a large scale is constructed without a plant for producing it by some process. It is as much a portion of the mechanical equipment as the elevator motor, or the lighting and heating apparatus. It is also being introduced for cooling purposes in theatre and other auditoriums; it maintains a pleasant temperature during the heated term in the hospital ward, and several companies have been formed to distribute it in cities through mains, as water and gas are supplied to the consumer. In some of the largest packing-houses of Kansas City and Chicago, not a pound of ice is used in a year for preservative purposes, although every department where the products of the beef, sheep, and hog are stored any length of time, is required to be at a temperature near or below the freezing point. Plants are now being made in this country to generate cold air for butter and butterine factories, ice-cream factories, chemical works, sugar refineries, molasses factories, paraffine works, oil refineries, stearine factories, chocolate factories, morgues, office buildings, skating rinks, steel-tempering plants, blast-furnaces, laundries, glue works, dry-plate works, dynamite-works, paint factories, soap factories, fur storage, India-rubber works and plants for seasoning lumber—a list including some of the country's most important industries.

While an extensive variety of machinery is being manufactured for refrigeration under a score of patents, the aim of all the inventors is the same—to perfect the most economical process to remove the heat from a certain temperature level to a higher level, discharging it at this point. With one ton of coal, a cold-air equivalent of from 8 to 14 tons of ice has been produced, the quantity varying according to the process employed. In the United States the refrigerating machines use anhydrous ammonia as the agent for generating low temperatures, mostly in conjunction with brine made from chloride of calcium and water. The ammonia is circulated through a series of pipes in which it evaporates. Then, in its gaseous form, it is pumped by the machine into the condensers and liquefied. The brine-cooler consists of a double pipe-coil. A small quantity of ammonia is injected through a needle valve, which allows a very fine stream to pass into the space between two pipes, running in a coil approximately 300 feet long surrounding a pipe containing the brine. From this coil the ammonia gas is drawn to the machine. The gas is forced thence into other coils, called the ammonia

condensers, which have water circulating over them. It is now in a heated condition from the compression. The water running over these coils cools off the gas, and at the same time condenses it into liquid anhydrous ammonia. In this form the ammonia is conducted to a receiving tank, and from there it again passes through the needle-valve into the brine-cooler, going through the same circuit again and again. The brine-cooler represents the apparatus where the brine and ammonia systems are in conjunction, the brine being pumped through the cooler, and from there through coils of pipe in the room in which it is desired to reduce the temperatures. This is sometimes to 20° F. below zero for freezing fish, sometimes to 32° F. for preserving meat, and often to 50° F. for preserving fruits and other perishables. The temperature is easily adjusted to the required degree by controlling the brine-flow in the piping. By lessening or increasing the flow in a single pipe, a wide range of temperature can be produced. Thus the same room can be used either for freezing the articles it contains, or merely for chilling them.

The capacity of a refrigerating machine is based upon the weight of ammonia in the gaseous form which it can discharge in 24 hours, each pound of gas representing a certain quantity of heat-absorbing power. The unit of capacity is the refrigeration which would be accomplished by the use of one ton of ice. Such a quantity will lower the temperature of 28,400 pounds of water 10 degrees. Therefore, if a "one-ton" machine is employed, it will cool 197½ pounds of water to the extent of one degree a minute. Tests made of the York type machines of this capacity show that one will keep the "curing" department of a packing-house containing 12,000 cubic feet of space, at a temperature of 40° F. or 1,500 cubic feet at zero. In other words, it is sufficient to keep 10 beeves or 25 hogs chilled at the former temperature. As a single plant used in the large packing-houses and breweries may represent 500 tons capacity, it will be seen that the cold storage compartments are maintained on a very elaborate scale, a single one containing thousands of carcasses. The horse-power required for one of these large machines aggregates 625. The air-compressors are built in various designs, and are known as single and double acting.

In large cold-storage warehouses the floors are not over eight or nine feet high. The pipe is attached to the walls, and in wide rooms to the sides of posts running through the middle of the room, so that an equal temperature can be maintained in all portions. In others, like fish-freezing rooms, the pipes are even used as shelves to hold the tins filled with fish, which are frozen into bricks and piled away in another compartment. Poultry and game are also kept in a frozen state, and the meat remains almost as hard as stone while in the cold room. Butter also is kept at a temperature near zero, which is said to preserve the flavor contained in its volatile oil, so that it is equal to fresh butter. Eggs are preserved sometimes from two to six months, but require particular care. The air in the room should be neither too moist nor too dry, and the chamber should be neither without ventilation nor supplied with too much, as then the eggs would lose in weight on account of their liability to evaporate through the shell.

COLD WAVE — COLDEN

Eggs, butter, and milk are also liable to be tainted by any smell arising from the woodwork, or articles stored in the neighborhood, and the rooms have to be constructed and arranged with this point in view.

The above, it may be said, have been problems for the cold-storage experts to solve by practical experiments; but food products can be preserved in properly constructed houses with as little difficulty as any other articles. In the preservation of meat, from the time that the beef, sheep, or hog is killed, it is kept in cold storage or "chill" rooms, until the time that it is taken from the refrigerator to be prepared for the table. The "chill" rooms are used to take the animal heat out of the meat, and reduce its temperature from about 98° F. to cold-storage temperature, that is, from 32° F. to 40° F. For this purpose the meat is hung on rails in rooms which have chambers in the upper part over the rails for ammonia or brine piping, which reduces the temperature to a point near freezing before the meat is put in. After the meat is put in, the animal heat it still contains raises the temperature in the room, but this is again gradually lowered, in the course of 24 to 48 hours, to the proper degree for refrigeration. This length of time is required in order to chill the meat thoroughly. Should it become chilled on the outside and remain warm in the centre, the centre part of the meat would be spoiled. From the "chill" room the meat is run into the cold-storage rooms and hung on rails, where it is kept until such time as it is to be shipped. The choicest pieces are kept at least four weeks in cold storage, as the quality is thus improved, and, if the rooms are kept clean, these pieces will taste better than meat which has been recently slaughtered. For this reason, not only slaughter-houses, but depots of packers and other buildings where meat is kept in cold storage, even to small butcher establishments, are preferably cooled by refrigerating machinery, owing to its dryness and cleanliness.

In some of the large hotels refrigerators cooled by machinery are even placed close to the ovens or ranges where the viands are prepared for consumption, the refrigeration being maintained at the proper standard despite the outside temperature. High temperature is also the rule in candy factories, but manufacturers of chocolate candy have been using refrigerating machines for some time. They are forced to do this, as the compound is apt to become soft in hot weather, which, of course, would spoil the appearance of the goods for the market. The arrangement of the refrigerating piping for chocolate factories has been made in various ways. In some instances a large refrigerator is cooled in the centre of the workroom with the piping inside of it, this refrigerator being of such length that endless belting carrying tins with chocolate enters it on one side and brings them out chilled on the other. In other workrooms a series of pipe coils are simply placed along the ceiling, and the cold air coming down chills the confectionery as it is made by the employees in the same room. The chocolate is then stored in refrigerators, apart from the workroom, and there properly packed at a low temperature. After being packed it can be sent out, and ordinarily will keep for an indefinite length of time.

One of the most interesting applications of cold storage, however, and one which has become very extensive, is for preserving furs and woollens, which are kept at a temperature of not over 20° F. to keep the moths from destroying them. These rooms have a very interesting appearance, as among the trunks, boxes, and drawers of clothing there appear figures of bears, tigers, and other stuffed animals in threatening attitudes, put away through the hot season by their owners and taken out in the fall. Sometimes furs are left in storage continuously for several years, yet at the end of the time they are invariably found in perfect condition. Many of the trust companies in the larger cities have such cold storage compartments. In these fur and clothing rooms, where valuable carpets and rugs are also stored, the air is generally cooled outside of the room and circulated through it by means of fans.

The cold storage building erected by the United States government at Manila is probably unexcelled in scientific construction. It has a storage capacity for 1,200 tons of beef, 200 tons of mutton, 50 tons of butter, 100 tons of potatoes, and 100 tons of bacon; or, in other words, sufficient food to feed an army of 10,000 men for three months. In addition to the ordinary freezing apparatus it has an ice plant with a daily output of 40 tons. The elevator, with its 2,400 pound lifting capacity, as well as most of the other appliances in the building, are operated by electricity. Connecting with the elevator is an overhead tracking system extending four miles, and the mechanism is so complete that a ship landing at a near-by pier has only to open her hatches and her cargo is transported to the storage almost automatically. The power in the building is furnished by three 200-horsepower engines.

Cold Wave, a term commonly used in the United States to denote a fall of at least 20° in temperature in 24 hours, bringing the temperature below the freezing point. It is due to steady winds from the northwest, which bring with them the chill conditions of the great west Canadian plains. This chill seems due to anti-cyclonic conditions which bring down to the surface the cold air of the upper atmosphere, and cause it to flow out over the southern and eastern United States.

Colden, kōl'dën, **Cadwallader**, American scientist and colonial official: b. Dunse, Scotland, 17 Feb. 1688; d. Long Island, N. Y., 28 Sept. 1776. He was graduated from the University of Edinburgh in 1705, and emigrated to the American colonies in 1708. He devoted himself to botany and astronomy and also to public affairs, becoming surveyor-general of New York and president of the council. He sided with the crown in the contest over the stamp act. Among his correspondents were Franklin and Linnaeus, and he wrote 'Cause of Gravitation' and 'History of the Five Indian Nations.'

Colden, **Cadwallader David**, American lawyer: b. near Flushing, L. I., 4 April 1769; d. Jersey City, N. J., 7 Feb. 1834. He studied law in England and the United States; began practice in New York in 1791, where he soon attained high rank in his profession. He was a member of the legislature and mayor of New

COLDSTREAM — COLE

York (1818), a member of Congress (1821), and of the State senate (1824-7). He was an earnest advocate of the system of internal improvements that was an important political issue early in the 19th century. He wrote: 'Life of Robert Fulton' (1817); 'Memoir of the Celebration of the Completion of the New York Canals' (1825); 'Vindication of the Steamboat Right Granted by New York State' (1819).

Cold'stream, Scotland, a town in Berwickshire, on the northern bank of the Tweed, which is here crossed by a bridge (erected by Smeaton in 1766) that unites the two kingdoms, and forms a well-frequented thoroughfare. The ford of Coldstream was a favorite point with the invading armies of England and Scotland when they passed alternately into each other's country. Pop. 1,535.

Coldstream Guards, a regiment in the Foot Guards or Household Brigade, the oldest in the British army except the First Foot, now called the Royal Scots. Raised in 1660 by Gen. Monk at Coldstream, it was at first called "Monk's Regiment." but when Parliament consented to give a brigade of guards to Charles II., this corps, under the name of Coldstream Guards, was included in it.

Coldwater, Mich., a city and county-seat of Branch County. It is in the southern tier of counties, 153 miles east of Chicago and 126 miles west-southwest of Detroit, on the Coldwater River and the Lake Shore & Mich. Southern Railway. Coldwater was first settled in 1830 by Hugh Campbell, became a borough in 1837 and a city in 1862. It is governed by a mayor and a common council of eight members, four members of which are elected yearly for a term of two years. The city has three banks, churches of all denominations, is in the centre of a rich farming community, has cement, shoe, wagon, milling and other industries, and owns and controls its waterworks and electric-light plant. Pop. (1903) 7,000.

Cole, Asahel N., American agriculturist and editor: b. 1821; d. Wellsville, N. Y., 14 July 1889. He was educated in the public schools of western New York State, and when 21 entered politics. He figured prominently as a Republican in the party's early days, and in 1852 he founded the 'Genesee Valley Free Press,' the pioneer Republican paper. He was no less noted as an agriculturist, being widely known as the father of subsurface irrigation.

Cole, Grenville Arthur James, English geologist: b. London 21 Oct. 1859. He was educated at the City of London School and the Royal School of Mines, and has been professor of geology at the Royal College of Science for Ireland since 1890. He has published: 'Aids in Practical Geology' (1891, 4th ed. 1902); 'The Gypsy Road' (1894); 'Open Air Studies' (1895); 'As We Ride' (with Blanche Cole) (1902).

Cole, Joseph Foxcroft, American landscape painter: b. Jay, Maine, 9 Nov. 1837; d. Boston, Mass., 2 May 1892. He studied in Paris under Lambinet and Jacque, and exhibited at the Centennial Exhibition in Philadelphia, 'Twilight,' 'Melrose Highlands,' and 'Coast Scene in Normany,' for which he was awarded

a gold medal. His work was somewhat impressionistic in character.

Cole, King, a legendary British king, described as a "merry old soul," fond of his pipe, and fond of his "bowl," and fond of his "fiddlers three." Colchester is said to have been his residence.

Cole, Samuel Winkley, American musician: b. Meriden, N. H., 24 Dec. 1848. He began his professional career at Portsmouth, N. H., 1877, was organist of the Clarendon Street Baptist Church, Boston, Mass., 1882-94, and teacher of sight singing in the New England Conservatory of Music since 1883. Since 1884 he has been supervisor of music in Brookline, Mass., and in Dedham, Mass., since 1886. In 1890 he produced Haydn's 'Creation' with the Dedham high school, and in 1891 Handel's 'Messiah,' being probably the first successful attempt in the United States to produce a complete oratorio with high school pupils. He has written: 'Child's First Studies in Music'; 'Course in General Sight-Reading'; 'New England Conservatory Course in Sight Singing.'

Cole, Thomas, American landscape painter: b. Bolton-le-Moors, Lancashire, England, 1 Feb. 1801; d. Catskill, N. Y., 11 Feb. 1848. His father, a woolen manufacturer, came to the United States when Thomas was 18 years old, and settled in Steubenville, Ohio. The son worked in his father's shop for two years, but the coming of a portrait painter to the village made him wish to be an artist. After a few lessons he set to work to paint pictures, and traveled for a while painting portraits and landscapes, but often had to paint chairs and japanned ware for a living. At last he went to New York, and by hard work succeeded in making himself one of the foremost landscape painters in this country. Among the best of his pictures are five called 'The Course of Empire,' and four called 'The Voyage of Life.' The last, showing childhood, youth, manhood, and old age, are very popular, and are well known through engravings. He was one of the founders of the National Academy, New York.

Cole, Timothy, American engraver: b. London, Eng., 1852. He emigrated to America in 1857; was burned out by the Chicago fire in 1871, and returned to New York penniless. In 1875 he entered the employ of the 'Century Magazine' (then 'Scribner's Monthly'), and in 1883 was sent to Europe to engrave pictures by the old masters. The first Italian series was finished in 1892, the Dutch and Flemish series in 1896, the English series, 1900, and he has of late been at work on a Spanish series. He stands easily at the head of living wood-engravers. His notes and short papers to accompany his engravings in the 'Century' have been published separately. He received a first class medal at the Paris Exposition, 1900.

Cole, Vicat, English landscape artist: b. Portsmouth, Eng., 1833; d. London 6 April 1893. He was a pupil of his father, George Cole (1810-83), a landscape painter also, and painted many studies from nature in Surrey, 'The Heart of Surrey' being one of his most noted works.

Cole, William Morse, American teacher: b. Boston, Mass., 10 Feb. 1866. He graduated at Harvard in 1890, and was instructor in political economy there 1890-3, and since 1900. From 1894 to 1898 he was a university extension lecturer, and secretary of the Massachusetts Commission on the Unemployed. He is the author of 'An Old Man's Romance' (1895), under the pseudonym of "Christopher Craigie."

Colebrook, Henry Thomas, English Sanskrit scholar: b. London 15 June 1765; d. there 10 March 1837. In 1782 his father's influence procured him a writership in the Bengal service. His duties as revenue officer at Tirhut led him to make a minute study of the state of husbandry in Bengal; his legal functions led him to study Indian law and learn Sanskrit; and he began in 1794 publishing essays on Indian religion, poetry, and science in the 'Asiatic Researches' of the Asiatic Society of Calcutta. His removal in 1795 to the magistracy of Mirzapur gave him the opportunity of cultivating the acquaintance of the learned men of the neighboring Sanskrit college at Benares, and with this advantage he brought out his 'Digest of Hindu Law on Contracts and Successions.' A mission to Nagpur (1799-1801) interrupted his work, and on his return he was appointed a judge of the new court of appeals at Calcutta, and at the same time honorary professor of Hindu Law and Sanskrit at the college of Fort William. Yet he contrived during this busy period to publish the first (and only) volume of his 'Sanskrit Grammar' (1805), based upon Pānini and the native commentators, to write his famous articles on the Vedas and on the sect of Jains, besides many other valuable essays for 'Asiatic Researches,' and also to supplement his 'Digest' by 'Two Treatises on the Hindu Law of Inheritance' (1810).

Coleman, Arthur Philemon, Canadian educator: b. Lachute, Quebec, 4 April 1852. He was educated at Victoria University and at the University of Breslau, and after some years of scientific work he became professor of geology and natural history in Victoria University, and in 1891 professor of assaying and metallurgy in the School of Practical Science, Toronto.

Coleman, John, American clergyman: b. Baltimore, Md., 11 Feb. 1803; d. St. Louis, Mo., 16 Sept. 1869. Until 1834 he was a Methodist. He entered the Protestant Episcopal ministry in 1836, and for 20 years was rector of Trinity Church, Philadelphia. He edited the religious paper Banner of the Cross (Philadelphia); and also edited Faber's 'Difficulties of Romanism' (1840); and Wilmer's 'Episcopal Manual' (1841).

Coleman, Leighton, American Protestant Episcopal bishop: b. Philadelphia 3 May 1837. He was graduated at the General Theological Seminary in 1861, was ordained to the Episcopal ministry in 1862, and after holding important rectorships, was consecrated bishop of Delaware in 1888. He has written 'The Church in America.'

Coleman, Lyman, American clergyman and scholar: b. Middlefield, Mass., 14 June 1796; d. Easton, Pa., 16 March 1882. He grad-

uated at Yale 1817; taught in Hartford, Conn., 1817-20; was tutor in Yale 1820-5, studying theology at the same time. He was pastor of the Congregational Church in Belchertown, Mass., for seven years, when he again took up teaching. He studied in Germany 1842-3, where he formed a close friendship with Neander, and returning, taught German at Princeton and Amherst 1845-6. In 1856 he traveled extensively through the Orient. He was professor of Latin and Greek in Lafayette College from 1861 to 1868, when he was transferred to the chair of Latin, which he held until his death. His writings, which were highly praised and regarded in their day, are: 'Antiquities of the Christian Church' (1841), translated from the German; 'The Apostolical and Primitive Church' (1844); 'Historical Geography of the Bible' (1850); 'Ancient Christianity' (1852); 'Historical Text-Book and Atlas of Biblical Geography' (rev. ed. 1859); 'Prelacy and Ritualism' (1869); and 'Genealogy of the Lyman Family in Great Britain and America' (1872).

Coleman, William Tell, American pioneer: b. Cynthiana, Ky., 29 Feb. 1824; d. San Francisco, Cal., 22 Nov. 1893. In 1849 he made the overland trip to California, and opened several stores for the sale of mining supplies. When in 1851 the famous Vigilance Committee of San Francisco was formed to rid the city of its formidable criminal element, Coleman became one of the most active members. In 1856 the committee was revived in consequence of the murder of James King, an editor of William, Cal. Coleman took charge of the trials, resisted official pressure against interfering with "the people," directed the execution of Casey and the other murderers, and carefully avoided any clash with the United States authorities. From 1857 to 1864 he directed his business from New York, aided in suppressing the draft riot, and contributed liberally to patriotic benefactions. In 1877-8, at the request of the citizens of San Francisco, he organized the Committee of Safety, to fight Dennis Kearney and his sandlots mob, and in this was highly successful. In 1888 his firm failed with liabilities of \$2,000,000, but in 1892 he personally paid off his entire indebtedness, more than he was legally bound to pay, with interest.

Colenso, John William, English clergyman, bishop of Natal: b. Saint Austell, Cornwall, 24 Jan. 1814; d. Bishopstowe, Natal, 20 June 1883. He was educated at St. John's College, Cambridge; was assistant-master at Harrow 1838-42; resided at St. John's College 1842-6, when he was preferred to the rectory of Fornsett, St. Mary, Norfolk, and on 20 November 1853 was appointed the first bishop of Natal. His numerous writings extend over a wide field. His treatises on arithmetic and algebra have become text-books in schools and universities. In 1853 he published a collection of 'Village Sermons'; in 1855 'Ten Weeks in Natal' and an edition of the 'Communion Service with Selections from the Writings of the Rev. F. D. Maurice'; in 1861 a 'Translation of the Epistle to the Romans Commented on from a Missionary Point of View.' In the following year public attention was widely attracted by the first part of his work on 'The Pentateuch and Book of Joshua Critically Examined,' in which the historical accuracy and

COLEOPTERA — COLERIDGE

Mosaic authorship of those books were called in question. This work was condemned as heretical by slight majorities in both Houses of Convocation of the province of Canterbury in 1864, and Colenso was declared to be deposed from his see by his metropolitan, the bishop of Cape Town. The deposition was, however, declared null and void on appeal to the privy council in March 1865. Notwithstanding this decision the prelates forming the council of the Colonial Bishops Fund refused to pay him his income, and he appealed to the court of chancery. The master of the rolls delivered judgment on 6 Oct. 1866, ordering the payment in future of his income, with all arrears and interest, but declaring that if his accusers had refused payment on the ground of heretical teaching he should have felt it his duty to try that issue, an offer which they declined to accept. One of the results of this ecclesiastical quarrel was that the Anglican community of the Cape was divided into two hostile parties; Colenso still remained the only bishop of the Church of England in Natal, but the Rev. W. K. Macrorie was consecrated bishop of Maritzburg for the Church of the province of South Africa 25 June 1869. About the end of 1874 Colenso visited England, and during this visit he pleaded before the secretary for the colonies and other members of the government the cause of Langalibalele, a Zulu chief who had been dispossessed of his territory and imprisoned at Cape Town. From that time forward the humane bishop was foremost in advocating the cause of the aboriginals against the oppression of the Boers and the encroaching policy of the Cape officials supported by Sir Bartie Frere. The captive Cetewayo (see ZULULAND) appealed to Colenso to place his case before the English people, and it was mainly owing to the bishop's efforts that the Zulu king was allowed to go to England to plead his own case with the ministry. In the meantime Colenso continued his literary labors. 'The New Bible Commentary by the Bishops and Other Clergy of the Anglican Church Critically Examined' was published in 1871, the seventh and last part of his work on the Pentateuch in 1879, and 'Lectures on the Pentateuch and Moabite Stone' in 1873. Consult Cox, 'Life of Bishop Colenso' (1888).

Coleop'tera (Gr. *koleos*, a sheath and *pteron*, a wing), an order of insects the species of which are commonly known by the name of beetles. The insects which constitute the order *Coleoptera* may be characterized as having four wings, of which the two superior are not suited to flight, but form a covering and protection to the two inferior, and are of a hard and horny or parchment-like nature, and when closed their inner margins, which are straight, touch, and form a longitudinal suture. The inferior wings, when not in use, are folded transversely under the superior, and are membranous. The appendages of the mouth are well adapted for cutting, and the metamorphosis is complete.

Coler, Bird Sim, American politician: b. Illinois 1868. He removed to New York, and with his father, established the stock-broking firm of W. N. Coler & Company. He became active in Democratic municipal and State politics was elected comptroller in the first administration of Greater New York under the

new city charter (1900-1), and was Democratic candidate for governor of the State in 1902. In 1905 he was elected President of the Borough of Brooklyn on the Municipal Ownership platform. He has written 'Municipal Government, as Illustrated by the Charter, Finances, and Public Charities of New York' (1900).

Coleraine, kōl-rān', Ireland, a town in the county of Londonderry, situated on both sides of the river Bann, about four miles from its mouth, and 47 miles northwest of Belfast. It has long been celebrated for its fine linens. Its trade, chiefly in agricultural produce, and provisions, is considerable; and it has a valuable salmon fishery. Pop. 6,800.

Coleridge, kōl'rīj, Christabel Rose, English novelist: b. Chelsea, England, 1843. She is a daughter of Derwent Coleridge (q.v.), and for many years assisted Miss Charlotte Mary Yonge (q.v.) in editing 'The Monthly Packet.' She has published: 'Lady Betty' (1869); 'Hanbury Mills' (1872); 'Hugh Crichton's Romance' (1873); 'The Face of Carlyon and Other Stories' (1875); 'The Constant Prince' (1878); 'Kingsworth' (1881); 'An English Squire' (1881); 'The Girls of Flaxby' (1882); 'A Near Relation' (1886); 'A Plunge Into Troubled Waters' (1888); 'Reuben Everett' (1888); 'Amethyst' (1891); 'Waynflete' (1893); 'The Tender Mercies of the Good' (1895); 'The Main Chance' (1897); 'The Thought Rope' (1898); 'Tricks and Trials' (1899); 'The Winds of Cathrigg' (1901); 'Fifty Pounds'; 'The Green Girls of Greythorpe'; 'Life and Letters of Charlotte Mary Yonge' (1903).

Coleridge, Derwent, English clergyman and author: b. Keswick, England, 14 Sept. 1800; d. Torquay, Devonshire, 2 April 1883. He was a son of Samuel Taylor Coleridge (q.v.). He took orders in the Established Church, and engaging in teaching was master of the grammar school in Helston, Cornwall, 1825-40; and principal of Saint Mark's College, Chelsea, 1841-64. He was rector of Hanwell, Middlesex, 1864-80. He published 'The Scriptural Character of the English Church' (1839).

Coleridge, Ernest Hartley, English literary editor: b. 8 Dec. 1846. He is a son of Derwent Coleridge (q.v.) and was educated at Balliol College, Oxford. He engaged in tutoring 1872-93, and besides editing the 'Letters of Samuel Taylor Coleridge' (1895); 'Animæ Poetæ,' selections from unpublished notebooks of S. T. Coleridge (1895), and the 'Poetical Works of Lord Byron' (1898-1902), has published a volume of 'Poems' (1898).

Coleridge, Hartley, English poet: b. Clevedon, near Bristol, 19 Sept. 1796; d. Rydal, Westmoreland, 6 Jan. 1849. He was the eldest son of S. T. Coleridge (q.v.), and upon the elder Coleridge taking up his residence in the Lake district, Hartley and his brother Derwent were placed as day scholars under the charge of a clergyman at Ambleside. In 1815 he became a student at Merton College, Oxford, and having inherited his father's conversational talents, was soon in great request at the wine parties and other festivities of the undergraduates. An unfortunate propensity was thus formed for drinking, which proved even more ruinous than his father's craving for opium. He obtained a fellowship at Oriel College, but



COLEOPTERA.

COLERIDGE

forfeited it for intemperance before the close of his probationary year. He then left Oxford and resided for two years in London, contributing occasionally to the 'London Magazine,' in which his first sonnets appeared. His friends induced him against his will to settle at Ambleside for the reception of pupils, but this scheme, as might have been expected, failed. He continued, however, to reside in the Lake country, and during this period enjoyed the friendship and good offices of Wordsworth, who had taken a paternal interest in him from a child. He likewise employed himself extensively in study and literary composition, contributing to 'Blackwood's Magazine,' and producing a volume of 'Poems,' and 'Worthies of Yorkshire and Lancashire.' Many of his sonnets will rank with the finest in the English language, while the charming vivacity of his biographies leave only room for regret that he had not accomplished more as a prose writer. In 1839 he wrote a life of Massinger for an edition of his works published by Moxon. He was buried in Grasmere churchyard, adjoining the spot where Wordsworth was laid a few months afterward. A memoir, with a collection of poems written by him in his later years, was published after his death by his brother Derwent.

Coleridge, Henry Nelson, English writer: b. Ottery Saint Mary, 19 Sept. 1796; d. 26 Jan. 1843. He was a nephew of S. T. Coleridge (q.v.) and was educated at Eton and King's College, Cambridge. Having accompanied, in 1825, his uncle, the Bishop of Barbadoes, on a voyage to that island, on his return he published an account of his sojourn, under the title of 'Six Months in the West Indies.' He was called to the bar in 1826, and shortly afterward married his cousin Sara, only daughter of Samuel Taylor, and sister to Hartley Coleridge. In 1830 he published an 'Introduction to the Study of the Greek Classic Poets,' and after his uncle's death set himself to the task of committing to writing the reminiscences of Coleridge's conversation, which were published under the title of 'Specimens of the Table-talk of the late Samuel Taylor Coleridge.' He also edited the posthumous writings of his uncle, including three volumes of 'Literary Remains,' published in 1836 and 1838, and 'Confessions of an Inquiring Spirit,' in 1840.

Coleridge, Herbert, English philologist: b. Hampstead, Eng., 7 Oct. 1830; d. London 23 April 1861. He was a son of Henry Nelson Coleridge (q.v.), and was one of the original planners of the dictionary outlined by the Philological Society and which in subsequent years has expanded into the 'New English Dictionary on Historical Principles' in process of preparation from 1884.

Coleridge, John Duke Coleridge, LORD, Lord Chief Justice of England: b. London 3 Dec. 1820; d. 14 June 1894. He was the eldest son of Sir John Taylor Coleridge (q.v.), judge, a nephew of Samuel Taylor Coleridge. He was educated at Eton and Balliol College, Oxford, and was called to the bar at the Middle Temple in 1846. In 1855 he was appointed to the recordership of Portsmouth, six years later he became a queen's counsel, and soon afterward was chosen a bencher of the Middle Temple. From 1865 till 1873 he represented Exeter in the House of Commons as a Liberal, and in

1868 he became solicitor-general under Mr. Gladstone, being knighted at the same time. Three years later he became attorney-general, and in 1873 he was appointed chief justice of the court of common pleas. In the same year he was raised to the peerage as Baron Coleridge of Ottery St. Mary, and in 1880 succeeded Sir Alexander Cockburn as lord chief justice of England. Lord Coleridge distinguished himself very highly when acting as chief counsel for the Tichborne family in the famous trial of 1871-2. He was the first lord chief justice who was granted the office with his present title, instead of the older one of lord chief justice of the court of queen's bench.

Coleridge, Sir John Taylor, English jurist: b. Tiverton, Eng., 1790; d. Ottery Saint Mary 11 Feb. 1876. He was educated at Oxford, and was called to the bar of the Middle Temple in 1819. In 1835 he was appointed justice of the king's bench, and was sworn of the privy council in 1858. As a literary critic he took high rank, and besides editing an edition of 'Blackstone's Commentaries' (1825), published a 'Life of John Keble' (1869).

Coleridge, Miss M. E., English novelist: She has published 'The Seven Sleepers of Ephesus' (1893); 'The King With Two Faces' (1897); 'Non Sequitur' (1900); 'The Fiery Dawn' (1901).

Coleridge, Samuel Taylor, English poet and critic: b. Ottery Saint Mary, near Exeter, in Devonshire, England, 21 Oct. 1772; d. Highgate, London, 25 July 1834. It is customary to divide Coleridge's life into three periods, according to the prevailing interest of each; most of his poetry was written before the close of 1798; from that year till 1818, he was chiefly interested in criticism; and the last 16 years of his life were given mainly to metaphysical studies. As in the case of De Quincey, the first part of his life usually receives by far the more attention, and the interest of the last period resolves itself into an account of his writings.

He was the son of the Rev. John Coleridge, vicar of Ottery Saint Mary, a man inclined to mysticism and transcendentalism but also a pretty successful school teacher, and his second wife, Anne Bowden, a competent woman of much common-sense. Coleridge, the youngest of ten by this marriage, was the precocious one of the family and was regarded as a prodigy for his early attainments. His amusements were reading and dreaming and he early showed a marked liking for mysterious and spiritual things. In 1782, after schooling at his native place, he was sent to Christ's Hospital for eight years, where he was subjected to a rigorous intellectual discipline at the hands of the Rev. James Boyer, of whose methods he spoke with respect in 'Biographia Literaria' At school he left a tradition, preserved by Lamb, of his intellectual and spiritual attainments. At Jesus College, Cambridge, which he entered in 1791 with a view to taking orders, he gained some distinction as a writer of Latin and Greek, read a great deal, particularly in the philosophers Berkeley and Hartley, and absorbed and advocated the doctrines of the French Revolution. This last brought him such notoriety

COLERIDGE

that, in the fall of 1793, he ran away incognito to London, and enlisted in a company of dragoons, but, weary of his experiment, obtained his release the following spring. The following summer he tramped about in England and Wales, made the acquaintance of Southey (q.v.), with whom he devised the "Pantisocracy" scheme for a social settlement on the banks of the Susquehanna, became engaged to Sarah Fricker, the sister of Southey's fiancée, and definitely terminated his university career. The year was an active and somewhat critical one. It was followed by his addresses on political subjects "Conciones ad Populum, or Addresses to the People" (1795), which preached liberty, praised revolutionary doctrines, and condemned government; by his marriage (1795); his editorial venture on the *Watchman* (March to May 1796), in which he tried to expound true opinions on such subjects as the principles of the French Revolution, Godwin's ideas, and the like, and, more important, by his settlement in Nether Stowey, Somerset, in 1797, where he came in contact with Wordsworth.

The meeting had important results in English literature, for it led, in 1798, to the publication of the 'Lyrical Ballads' (see WORDSWORTH). Coleridge's own contribution to this volume, designed by its authors to change poetical taste, was his masterpiece 'The Ancient Mariner.' The year practically marks the end of his poetical production, though the famous 'Christabel' was not finished till two years later, and remained unpublished till 1816. Coleridge had previously written many poems; many of these were published in 1796 and 1797, under the title 'Poems on Various Subjects,' and he had also tried his hand at several dramas. Aside from the masterly 'Ancient Mariner,' 'Christabel' and 'Kubla Khan,' on which, together with a few others, his fame as a poet rests, the poems are chiefly interesting as showing the tenor of Coleridge's mind. In substance they are what is generally termed romantic, and are almost always treated with a view to expressing some underlying mystery. In style they might be called accumulative, in that they progress by the piling up of a great number of images, and in many respects they imitate the epithetical manner of Gray, but are less successful and less restrained. The great poems named are, of course, among the most original in the language. 1797-98 was the poet's golden year.

The middle period of Coleridge's life is marked by great desultoriness. It opened with much promise. After a journey to Germany (Sept. 1798 to Sept. 1799), in company with Wordsworth, he returned to England, where his first work was his brilliant translation of Schiller's 'Wallenstein,' usually regarded as one of the masterpieces of English translation. That same year and the following year he wrote a number of able articles for the *Morning Post* condemning, on the one hand, the policy of Pitt and, with equal zeal for the cause of liberty, the aggressions of Bonaparte. The impulse was short-lived. Failing health and growing restlessness caused him to go to Malta in 1804. It is known that at this period he was taking opium, but whether strictly for the alleviation of his pain, or whether the opium

was the cause of his failing health, is not definitely known. He made the acquaintance of the drug nearly ten years before and the severest of his critics, Mr. Robertson, maintains that all his most brilliant poems were written under its influence, but the whole matter is in some uncertainty, except for the fact that for a matter of 12 years he was, except at rare intervals, incapacitated from doing sustained work. From 1804 to 1816 he lived in great depression. A residence of two years and a half at Malta, where he was secretary to the governor, Sir Alexander Ball, was of no benefit to his health, and on the whole showed a weakening of purpose, as was natural to a man of weak will when removed from the guiding influence of friends. On his return his life was desultory and nomadic and he found himself in hard circumstances. Gradually becoming estranged from his friends and his family, he finally separated from his wife, and in 1810 left the Lake region for good. From that year till 1816, he lived at Hammersmith, London, and at Calne, in Wiltshire, with an old friend, John Morgan, by whom he was treated with the utmost kindness. Early in 1816, however, the Morgans, owing to loss of property, were obliged to give up the task, and, moreover, Coleridge, to whom the six years had been the most futile of his life, felt obliged to take some more energetic measures to redeem himself. Accordingly, in April 1816, a home was found for him with Dr. Gillman, in Highgate, London, where his health might be watched with care and firmness, and here he remained the rest of his life.

Up to 1818, as has been said, Coleridge was chiefly interested in criticism, but his work was, naturally, of a desultory nature. His first public utterances, after the articles in the *Morning Post*, were a series of 18 lectures on 'Poetry and the Fine Arts,' delivered at the Royal Institution in London, from January to May 1808. He had previously projected a course of lectures on the same subject, but they had come to nothing. The lectures of 1808 were very poorly given and were unsuccessful; DeQuincey has a vivid picture of the miserable figure that Coleridge presented as he faced his audience. Three courses in the winter of 1811-12 chiefly on Shakespeare and Milton, had a better fate, and, from accounts, must have made a great impression. These courses were recast into two which were badly delivered at Bristol in the winter of 1813-14. In 1818, Coleridge closed his career as a lecturer with a course on the history of literature which added much to his reputation. These various talks were published for the first time in 1836, in vols. I. and II. of Coleridge's 'Literary Remains.' In their present shape they are fragmentary; some are pretty complete, others merely marginal jottings, and others exist only in name.

Considered as a whole, these lectures attempted to define poetry, to trace in some detail the course of literature, to exalt to an unprecedented height the name and fame of Shakespeare, and to give his readers material for a sound critical judgment. Concerning the last of these points he said, for example, in the course of 1818, that he desired "To convey, in a form best fitted to render them impressive at the time, and remembered afterwards, rules and

COLERIDGE

principles of sound judgment, with a kind and degree of connected information such as the hearers cannot generally be supposed likely to form, collect, and arrange for themselves by their own unassisted studies," and he added, "I hope to satisfy many an ingenious mind, seriously interested in its own development and cultivation, how moderate a number of volumes, if only they be judiciously chosen, will suffice for the attainment of every wise and desirable purpose: that is, in addition to those which he studies for specific and professional purposes." Among the many great names which he chose to illustrate this oft-repeated idea, Shakespeare, in all the courses of lectures, occupied the chief place. His chief thesis, that Shakespeare is a poet of consummate poetical power and that his judgment is equal to his genius, he illustrated and illuminated with copious analysis and criticism, chiefly by running interpretation of the different plays and by pregnant statements of the fundamental differences in dramatic interest in the different types of play. Generally speaking his point of view is that of a man interested in works that express the soul, the reason, and the imagination, rather than outward situation, intelligence, fancy, or wit. More narrowly, it is the criticism of a man who gloried in the superiority of the literature of his own country, and of the moralist who abhorred the quality of the 'Decameron' and the misanthropy of Swift, and who praised the moral lessons of 'Robinson Crusoe' and 'Macbeth.' Nearly all his criticism in these lectures shows a love of fundamental distinctions, as, for example, the chivalric spirit of Spenser as compared with the universal, impersonal spirit of Shakespeare; or the distinctions between the witty, the droll, the odd, the humorous, etc., as illustrated by Rabelais, Swift, Sterne, and others. This idea of drawing fundamental distinctions has had a great influence on succeeding criticism.

Even more characteristic of the Coleridge of this period was the series of essays called 'The Friend.' This he intended to issue in Jan. 1809, but he characteristically put it off until the midsummer. Thence it ran till March 1810. He attempted to publish it himself as a weekly periodical from the Lake district, but his practical mismanagement was such that it rarely came out on time, and the scheme came to an end with the 27th number, long before he had reached his main point. The work was re-issued in 1818 with additions. The plan of the periodical, as well as Coleridge's conduct of it, foredoomed it to failure. Without regard to the work of his predecessors in the essay field, he attempted to treat philosophical questions and inflicted them on his readers with little variety and much diffuseness. The volume as it stands to-day contains three main parts dealing respectively with the laws of right thinking for the individual as an individual, the principles of political knowledge, and the "grounds of morals and religion and the discipline of the mind requisite for the understanding of the same." These are separated by essays in a lighter vein entitled 'Landing Places.' In spite, however, of the total lack of adaptation of the subjects to the tastes of his readers and to the periodical form, and his own unbusinesslike ways, the book as it now stands is regarded as

containing much of Coleridge's most stimulating work, his best flashes of insight, and is, in particular, replete with those famous distinctions, like that between reason and understanding, truth and veracity, which have proved stimulating to the spirits of succeeding generations. Much of its value lies in its point of view, which is that of an idealist who believes that motives are more important than results and that right thinking on all questions is better than action directed by mere prudence; and it lies also in his persuasive and winning style.

More important than 'The Friend,' indeed his most valuable work, is the 'Biographia Literaria.' This he projected and in a measure composed in 1815, but the happy results of his change to the Gillman's probably allowed him to improve the form of the book for its publication in 1817. His specific purpose, characteristically enunciated after the book was well under way, was to give voice to miscellaneous reflections suggested by particular events, to state his views on politics, religion, philosophy, poetry, and criticism, and to settle, on principle, the controversy that had grown up about the 'Lyrical Ballads.' On the philosophical side, the book amounts to a protest against materialist views of the origin of ideas, and it is notable for his digressions and distinctions, as that important one, which he borrowed largely from Schelling, between the objective facts of the world and a self-sustaining and self-regulating consciousness, independent and indestructible. The critical ideas, brought out most vigorously in his classic criticism of Wordsworth, are more important, and are among the most influential ever enunciated by any English critic. Abandoning the formalism of preceding English critics, and eschewing the oracular dogmatism of contemporary reviewers, such as Jeffrey, he rested his critical case on (1) a theory of poetry deduced, not from authority, but from philosophy, logic, psychology, and what he called "the nature of man"; (2) on the actual phenomena as presented by the actual vogue of an author, a complete, rather than a partial, view of an author's production, the purpose of the author as revealed in the interpretation of his meaning, and an analysis of the qualities of his style; and (3), in a wholly impressionistic way, on a feeling for what is good in poetry—which last, indeed, is really his ultimate test. So far as can be seen by a comparison with such earlier critics as Dryden, Addison, and Johnson, he pushed to a further degree than his distinguished predecessors his dependence on a theory of art and on philosophy, his reliance on analysis of qualities, and his personal feeling for what is good; and he is practically original among English critics up to his time in taking into account as necessary points of departure, the vogue of an author and his purpose. He differs from such contemporary critics as Lamb and Hazlitt in not trusting, at least ostensibly, to feeling alone, and from DeQuincey, in that the latter usually lays chief stress on what might be termed the intellectual contribution of an author. The more strictly autobiographical parts of 'Biographia Literaria' deal for the most part with Coleridge's intellectual experiences and the influences to which he was subject.

COLERIDGE

The remaining literary work of this period is of less importance. It comprises some desultory and comparatively colorless articles for the *Courier* in 1808 and 1811, chiefly against Bonaparte, the recasting and acting (1813) with some success of his drama 'Remorse' and the writing of the pastoral play 'Zapolya' (1817), 'The Statesman's Manual' (1816), a challenge to "all the critical benches of infidelity to point out any one important truth, any one efficient practical direction or warning, which did not pre-exist (and for the most part in a sounder, more intelligible, and more comprehensive form) in the Bible," and "A lay sermon addressed to the higher and middle classes on the existing distresses and discontents" (1817), an earnest and eloquent appeal to his readers to live by reason and wisdom and to refer conduct to ultimate principles.

The last named titles anticipate the chief subject of the so-called last period of Coleridge's career—his interest in theology and metaphysics. His writings on those subjects are embraced in three chief titles—'Aids to Reflection' (1825), 'On the Constitution of the Church and State' (1830), and the posthumous 'Confessions of an Enquiring Spirit' (1840, written between 1824 and 1834). Though these writings probably did more than any other of the author's to give him the great reputation which he had in the contemporary and succeeding generation, they add little to our knowledge of the great principles which dominated Coleridge's intellectual life. The 'Aids to Reflection,' his most important spiritual work, is a series of aphorisms designed to help the reader to think and feel rightly, that is in an orthodox, Anglican way, on spiritual matters. In his own words, he aimed "to direct the reader's attention to the value and science of words—to establish the distinct characters of prudence, morality, and religion—to substantiate and set forth at large the momentous distinction between reason and understanding—to exhibit a full and consistent scheme of the Christian Dispensation, and more largely of all the peculiar doctrines of the Christian Faith." His point of view is characteristically theoretical, introspective, and mystical, rather than objective and historical, and his exposition is, as usual, fragmentary and unsystematic. 'On the Constitution of the Church and State,' a more regularly sustained thesis, contains much the same premises, and is a piece of special pleading, ostensibly designed to show the people of England how to think and vote rightly on the question of Catholic emancipation. It is substantially an argument in favor of the national church. The 'Confessions' is one of the most striking expressions of a well-known doctrine of the 19th century that the Bible, the only sufficient rule of faith and practice, is nevertheless not to be taken literally but in what Arnold later called a literary way and Coleridge here called "according to reason." The demonstration of its truth is internal, not dogmatic. To this period also belongs Coleridge's 'Table Talk,' published after his death from the notes made by H. N. Coleridge between 1822 and 1834, and containing a rich and varied array of observations, chiefly philosophic in character, from the most brilliant talker of the time.

Critics of Coleridge are pretty well united in calling him one of the great sources of intellectual stimulus of his generation. His supporters, like Mill, point out the fundamental fact of his vast influence in fecundating the mind of his contemporaries. His detractors, like J. M. Robertson, lay stress on his desultory habits of mind, his weakness of character, and his vast plagiarism "unparalleled in literary history." The truth is probably that he so keenly and genuinely desired to find fundamental principles and sanctions for belief and action that he did not mind where he got his principles so long as they impressed him. Setting aside the question of his influence, his work (aside from his poetry) is, as it stands, remarkable for its avoidance of history in all its forms, of science as we know the term, and for its confinement to the fields of philosophy, metaphysics, theology, and criticism. In these fields it is almost wholly introspective, it consists of an examination of the contents of his mind, and is noteworthy for an almost complete lack of sense for external fact. Within these limits, few writers have scattered broadcast so many stimulating ideas; his apothegms and pregnant sayings are enormous in number, as well as recurrent. Added to this is an acute logical sense for detecting flaws in the arguments of an opposing view, a feeling for axiomatic proof, and a style, which, though desultory and essentially a monologue, is often marked by grandeur and charm.

Bibliography.—The standard edition of the works is that edited by Shedd (1853) in 7 vols., which is complete except for some of the articles from the *Morning Post* and the *Watchman*, and as yet unpublished marginalia. Separate editions of the poems and certain of the prose writings are numerous. There are lives by H. D. Traill in the 'English Men of Letters,' Professor Alois Brandl (trans. by Lady Eastlake), and Leslie Stephen in the 'Dictionary of National Biography.' Hall Caine in 'Great Writers Series,' and J. D. Campbell. Representative essays of diverse views are those of J. S. Mill ('Dissertations and Discussions,' vol. 2), Leslie Stephen ('Hours in a Library,' vol. 3), Walter Pater ('Appreciations'), G. E. Woodberry ('The Makers of Literature'), and J. M. Robertson ('New Essays Toward a Critical Method').

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Coleridge, Sara, English poet: b. Keswick 22 Dec. 1802; d. London 3 May 1852. She was the daughter of S. T. Coleridge (q.v.), and was married to Henry Nelson Coleridge in 1829. She is best known by the romance 'Phantasmion,' and her editions of 'Aids to Reflection,' and other works. She was also author of 'Pretty Lessons for Little Children.' Her 'Memoirs and Letters' appeared in 1873.

Coleridge, Stephen, English author and artist: b. 31 May 1854. He was educated at Bradfield College, and Trinity College, Cambridge. He has exhibited pictures at Birmingham, Leeds, and elsewhere, is honorary secretary of the National Anti-vivisection Society, and has published 'Demetrius' (1887); 'The Sanctity of Confession' (1890); 'Gloria' (1903).

COLES — COLGATE UNIVERSITY

Coles, kōlz, Abraham, American prose-writer and poet: b. Scotch Plains, N. J., 26 Dec. 1813; d. Monterey, Cal., 3 May 1891. In 1835 he graduated from Jefferson Medical College, Philadelphia. He published 13 original translations of the celebrated hymn 'Dies Iræ' (1859); 'Old Gems in New Settings' (1866); 'The Microcosm'; and 'The Light of the World' (1884).

Coles, Edward, American political leader: b. Albemarle County, Va., 15 Dec. 1786; d. Philadelphia, Pa., 7 July 1868. He was graduated from William and Mary College in 1807. He was Madison's private secretary from 1810 to 1816, and in 1817 was sent on a diplomatic mission to Russia. Shortly after his return to the United States he removed to Illinois; while living in Virginia he had owned slaves, but took them with him and liberated them, and soon became prominently identified with the anti-slavery party in Illinois. In 1822 he was elected governor of the State, holding that office till 1826. During his administration an attempt was made to amend the State constitution in favor of slavery, but under his leadership the anti-slavery party carried on a vigorous campaign in opposition to the proposed amendment and decisively defeated it. After 1833 he lived in Philadelphia. Consult Washburne, 'Sketch of Edward Coles.'

Colet, kōl'ēt, John, English divine, founder of St. Paul's School, London: b. London 1466; d. there 16 Sept. 1519. His father, Sir Henry Colet, was twice lord mayor of London. About 1493 he set out to make a continental tour, and became acquainted with several of the most eminent men of the time, and more especially with Erasmus. While on the continent, he studied Greek, canon, and civil law, and the writings of the fathers. In 1496 he returned to England, and in the following year he was ordained, took up his residence in Oxford, and lectured in Latin on St. Paul's Epistle to the Romans. He was an ardent advocate of the new learning and an admirable Biblical scholar. Erasmus was one of his audience at a later series of lectures on the First Epistle to the Corinthians, and from this time (1498) the two became warm personal friends. In 1505 Colet was appointed dean of St. Paul's. With Sir Thomas More and others he urgently advocated the reform of certain ecclesiastical abuses, but it is an utter mistake to suppose that he held anything in common with the spirit of the Protestant Reformation. St. Paul's School was founded and endowed in 1512, the earliest school in England in which Greek was a regular part of the curriculum. His writings are not numerous, but gave good evidence of his learning and piety. In 1867-76, J. H. Lupton produced an edition of those of Colet's works not published during the 16th and 17th centuries. The most recent biography is that by Lupton (1887).

Colet, Louise Révoil, loo-ēz rā-vwāl kō-lā, French poet and novelist: b. Aix, France, 15 Sept. 1810; d. Paris 8 March 1876. Four times between 1839 and 1855, poems of hers were crowned by the French Academy. She was a graceful lyrist, and often struck the chord of deep passion with effect. Of her verses, poured forth with marvelous facility, 'The Woman's Poem' is perhaps her best after the four offered to the Academy. Among her

numerous novels, 'Bruised Hearts' (1843) may be mentioned. She also wrote several narratives of travel.

Colewort, kōl'wért, a common name for several cultivated varieties of cabbage (q.v.).

Col'fax, Schuyler, American statesman: b. New York 23 March 1823; d. Mankato, Minn., 13 Jan. 1885. He removed in 1836 to Indiana, where in 1845 he acquired a newspaper at South Bend, which he made the most influential Whig journal in the district. He was a delegate to the Whig conventions of 1848 and 1852; was elected to Congress in 1854 by the newly formed Republican party, and re-elected until 1869, being thrice chosen speaker; and in 1868 he was elected vice-president of the United States, in Grant's first term. Implicated, unjustly, as he and his friends claimed, in the Credit Mobilier charges of 1873, he spent the remainder of his life in political retirement, making public appearances only on the lecture platform. He was the founder of the Daughters of Rebekah branch of American Odd Fellowship.

Colfax, Wash., city, county-seat of Whitman County. It is situated on the Palouse River, the line of the Oregon Railroad and Navigation Company, and 80 miles south of Spokane. It is a trade centre for the products of the fertile, surrounding country; grains, lumber, and live stock are the chief exports. Manufactures are increasing. The waterworks are owned by the city. Pop. 2,300.

Col'gate, James Boorman, American philanthropist: b. New York 4 March 1818; d. Yonkers, N. Y., 7 Feb. 1904. He was for some years a member of the dry goods firm of Colgate & Abbe in New York, and in 1852 formed a partnership with J. B. Trevor as dealers in stocks and securities. To Colgate University (q.v.) he gave several buildings and an endowment of \$1,000,000, called the Dodge Memorial Fund, and also gave to other institutions.

Colgate, Samuel, American manufacturer: b. New York 22 March 1822; d. Orange, N. J., 23 April 1897. He was a son of William Colgate, founder of the soap and perfumery house of Colgate & Company. Samuel Colgate succeeded his father as head of the firm, and continued his father's generous benefactions to religious, educational, and charitable enterprises. With his brother, he erected Colgate Academy building in Hamilton, N. Y., at a cost of \$60,000, and in recognition of their munificent gifts to Madison University, in the same place, the name of that institution was changed to Colgate University. He was a contributor to every charity in Orange, N. J., and at his death bequeathed to Colgate University his valuable collection of Baptist reports and literature, numbering 40,000 titles, in several languages.

Colgate University, an educational institution at Hamilton, N. Y., founded in 1819 as a school for the education of Baptist ministers. The collegiate and preparatory departments were later added. The name was originally Madison University, and was changed in 1890 in honor of the principal benefactors, the Colgate family. Soon afterward James B. Colgate established an endowment fund of \$1,000,000 in memory of Ebenezer Dodge, who was president for over 20 years. The theological seminary, which was at first a separate corporation,

COLIC — COLIMA

was incorporated with the university, the professors being members of the university faculty; the preparatory department (Colgate Academy) is also a part of the university, and its principal a member of the faculty. The college has two distinct courses, leading to the degrees of A.B. and B.S., and provision is made for graduate work for the corresponding masters' degrees. The theological course (three years) leads to the degree of B.D. The library numbers nearly 35,000 bound volumes; besides this there is in the library building the Baptist Historical Collection, of about 60,000 volumes and pamphlets, the bequest of Mr. Samuel Colgate. At the end of 1905 the university reported 37 professors and instructors, 413 students (228 in the college); value of property over \$2,200,000; president, George E. Merrill, D.D.

Colic, in pathology, a painful affection of the intestines, especially of the large bowel or colon, whence the name. The pain is due to spasmodic and irregular contractions of the colon, and is felt chiefly in the region of the navel. It is of a severe twisting character, and comes on in paroxysms, occasionally so severe that the patient rolls and twists about, usually doubled up and grasping his abdomen, and not seldom groaning or crying. Constipation of the bowels usually accompanies colic, and the pain may give rise to vomiting. Often, however, severe colicky pains are the forerunner of looseness of the bowels, caused by some food which has disagreed. The pain may be caused by wind, the discharge of which affords great relief. There is no fever with the attack, but the pulse is usually lowered, and the face pale and anxious-looking. In this respect colic differs from inflammatory attacks of the bowels. Pressure on the abdomen generally gives relief in cases of colic, but in cases of inflammation the patient cannot endure pressure. Whether the attack be one of colic or not may readily be learned from the attitude of the sufferer and the fact of his exerting or avoiding pressure. Treatment consists in applying hot cloths or bags of hot salt across the abdomen. Doses of medicine, such as castor-oil, should also be administered, and a large injection of water at a gentle warmth will probably bring relief. In the case of an adult patient 30 drops of laudanum may be given along with the castor-oil, or shortly after it. Magnesia and dill-water are also used as remedies for colic in young children. What is called biliary or renal colic is caused by the passage of gall-stones or kidney stones toward the bowel or bladder respectively. It occurs oftener in women than in men.

Coligny, kō-lēn-yē, **Gaspard de**, French soldier: b. Châtillon-sur-Loing 16 Feb. 1517; d. Paris 24 Aug. 1572. After a brilliant military career he was made in 1552 admiral of France. He was distinguished for valor in battle, for strict discipline, and for his conquests over the Spaniards, in particular for his defense of St. Quentin. When St. Quentin was taken by storm, the admiral was made prisoner. After the death of Henry II., the intrigues of Catharine de Medici induced him to place himself at the head of the Calvinists against the Guises. He formed so powerful a party that the Catholic religion in France seemed to be in danger. Condé was more ambitious, enterpris-

ing, active; Coligny more considerate, prudent, and more fit to be the leader of a party; equally unfortunate in war with Condé, but skilled in remedying even what appeared irretrievable losses, and more to be feared after a defeat than his enemies after a victory. The first battle between the Huguenots and Catholics (1562, at Dreux) was lost by the admiral, but he saved his army. When the Duke of Guise was murdered at the siege of Orleans, he was accused of being the author of the murder. The civil war re-commenced with increased fury in 1567. Coligny and Condé encountered the Constable Montmorency at St. Denis. This indecisive action was followed by the battle of Jarnac in 1569, which was fatal to the Calvinists. Condé fell, and the whole burden of command devolved on Coligny. An advantageous peace seemingly put a stop to this contest in 1570. Coligny appeared at court, and was, with his adherents, loaded with favors. Charles IX. gave him 100,000 francs as an indemnification for his injuries, together with a seat in the council. From all sides he was warned not to trust to these caresses. As the admiral was leaving the Louvre 22 Aug. 1572 his right hand and left arm were wounded by a shot from a window. One Maurenal had fired at him from a building belonging to the monastery of St. Germain l'Auxerrois, according to the plan of Catharine de Medici, probably with the knowledge of the Duke of Guise. Charles testified the deepest sorrow, caused search to be made for the assassin, and said to Coligny, "My father, you have the wounds, but I the pain." This he said at the moment when the massacre of the Protestants was already prepared. The slaughter began on the night of St. Bartholomew's, 24 Aug. 1572. The Duke of Guise hastened with a numerous suite to the house of the admiral. One Behme, or Besme, at their head, entered with his drawn sword into the chamber of the old man, pierced him with several stabs and threw the body out of the window into the courtyard.

Coliidae. See MOUSEBIRD.

Colima, kō-lē'mä, Mexico, a state in the southwest of the United States of Mexico. It includes the four desert islands, Socorro, Rosa Partida, San Benedicto, and Clarion, which form the Revillagigedo group. The northern section of the state is occupied by the slopes of the Colima volcanoes. The Armeria River flows through the state, and the Coahuayana is on the boundary. There are two lakes, Cuyuthan and Alcuzaque. The climate, except in the mountainous region, is hot and unhealthy. Rainfall is abundant, and malaria prevails. Salt, silver, gold, sulphur, and copper are found; about 170 species of trees, including fruit, and trees, the parts of which are useful for tanning, dyeing, clothing, food, and medicine. The chief products are coffee, cacao, tobacco, rice, cotton, indigo, sugarcane, cereal, and leguminous plants. The principal industries are agriculture, stock-raising, and working in the salt sections. Much of the trade is with the other states of Mexico, especially those along the coast, but it has a growing trade with Germany, Hawaii, and the United States cities on the Pacific. Exports are: rice, coffee, rubber, fruits, cabinet and dye woods, corn, hides and skins, and minerals. Imports are: woolen, linen, and silk

COLIMA — COLLARS AND CUFFS

goods, foodstuffs, wines and liquors, glass-ware, firearms and ammunition. The Pacific Mail, Red Line, Izaquirre, and the Sinaloa and Durango Railway Company's steamers connect the port of Manzanillo with other ports, foreign and domestic.

Colima, Mexico, capital of the state of Colima. It is situated in a fertile valley, which is irrigated by the Colima River. The principal buildings are the city hall, cathedral, theatre, the station of the Mexican N. R.R., and a new market. It has an electric-lighting system, a street-car line, etc. (See COLIMA, THE STATE OF.) Pop. 18,977.

Colin Clout, *kōl'in klowt*, a satire by John Skelton. It was a vigorous pre-Reformation protest against the clergy's lack of learning and piety.

Colise'um, more properly **Colosseum**, a gigantic ruin in Rome, the greatest amphitheatre which Roman magnificence ever erected. It was commenced by Vespasian (reigned 69-79 A.D.), and practically finished by Titus about the year 80 A.D., who dedicated it with shows in which 5,000 animals were killed. It was built to furnish a place for amusements for the Roman people; such as gladiatorial combats, fights with wild beasts, and less harmless athletic sports. In the early days of Christianity it was the scene of the martyrdom of a number of the Christians. It is said to have held 100,000 spectators, of whom about 87,000 were seated. For the greater part it consists of travertine, is elliptical in shape, 1,680 feet in circumference, and 157 feet high, and has three rows of columns, one above the other: the lowest is of the Doric, the second the Ionic, and the highest the Corinthian order. The diameter of the arena from side to side was 182 feet, from end to end 285 feet. Down to the 6th century this monument of ancient grandeur remained almost uninjured, when Theodoric, king of the Goths, caused material to be taken from it for the construction of various buildings; afterward Pope Paul II. took all the stones from it, which were used for the construction of the palace of St. Mark, and in later times some other palaces were erected from its fragments.

Colitis, *kō-lī'tis*, a general term indicating a disorder of the large intestine or colon. Disease or disorders of the colon may be due to a large variety of causes. A simple diarrhoea may persist, becoming chronic, or an enterocolitis (q.v.), or the initial process may have been dysenteric in character and, persisting, may have become a chronic colitis (see DYSENTERY).

Col'lamer, Jacob, American senator: b. Troy, N. Y., 8 Jan. 1791; d. Woodstock, Vt., 9 Nov. 1865. He graduated at the University of Vermont 1810, studied law at Saint Albans, and was admitted to the bar 1813. He became associate justice of the Vermont supreme court 1833-42; representative in Congress 1843-7; was appointed postmaster-general in 1849, but resigned upon the death of President Taylor; was again elected judge of the Vermont supreme court and held that office until 1854, when he was elected United States senator and remained such until his death.

Collar-bone. See CLAVICLE.

Collars and Cuffs, Manufacture of. The collar trade, a distinct and important branch of the "gent's furnishing" industry, originated at Troy, N. Y., about 1825, when the wife of a blacksmith conceived the idea of making the first detachable collar. Prior to that time shirts had always been made with the collars and cuffs attached to them, and no one seems to have thought that they might possibly be detached until the day her scissors cut the first pattern from a strip of paper. It is unfortunate, from the point of view of the historian, that the name of this clever woman should have been lost, and it is to be hoped that her inventive genius was financially rewarded. That she must have reaped some benefit from the innovation there can be but little doubt, for the detachable collar soon became extremely popular, and, in 1829, Rev. Ebenezer Brown, who had retired from the Methodist ministry to establish a dry goods store in Troy, opened a small factory that he might manufacture such collars in greater quantities.

As this branch of Mr. Brown's business increased very rapidly it was not long before he had several imitators. Somewhat prior to 1834 Orlando Montague and Austin Granger, who were then in business under the firm name of Montague & Granger, erected a still larger factory and devoted it to this industry. About a year later Independence Stark began to make collars in quantities, and, about 1837, he opened an establishment for the laundering of collars, both his own and other manufacturer's make. As this was undoubtedly the first "Troy Laundry," a name which is now known from one end of the land to the other, it is interesting to note that the inauguration of this independent industry was so largely the effect of the invention of the detachable collar. In these days, collars were known as "String Collars," because they were then tied around the neck by means of a string attached to each end. They were worn with the old-fashioned stock tie.

The manufacture of detachable cuffs did not begin until 1845, and, as in the making of cuffs, everything was then done by hand. In fact it was not until the latter part of 1851 that anybody had considered it possible to manufacture such a product by machinery, and, when Nathaniel Wheeler, of the firm of Wheeler & Wilson, attempted to introduce his new sewing machine, the collar and cuff makers laughed at him for his presumption in declaring that his invention would enable them to produce as good a collar or cuff at a cheaper cost than any human agency could sew it. Among all the Troy manufacturers only one, Jefferson Gardner, was willing to give the machine a trial, but his experiences were so satisfactory that, within twelve months, the other factories were not only supplied with similar machines, but one of the manufacturers, W. O. Edson, of the firm of Bennett & Edson, was also operating them by means of steam power.

The second great invention to which the amazing growth of the collar and cuff industry is so largely due was the introduction of the button-hole sewing machine, in 1875. If it had not been for this timely discovery the makers of collars and cuffs in the United States would never have been able to supply the demands of

COLLATION — COLLEGE

the market. At the present time, for example, they are required to make over 500,000,000 button-holes per annum, and to have found a sufficient number of human hands to have made these button-holes would have been a practical impossibility.

Those who are unacquainted with the manufacture of collars and cuffs would be surprised if they could see the almost infinite detail with which the making of these common articles of wearing apparel is attended. A single collar, for example, will often pass through as many as twenty-five different operations, each of which requires the attention of a workman who is an expert in his particular line of the trade. The designing of patterns is also expert work, as there are sometimes many patterns for a single collar, each ply being cut to a different measure.

It is an extremely difficult matter to secure anything like reliable statistics relating to the collar and cuff industry, because, as an industry, it is of such recent origin that it was not honored with a separate classification in any United States census report prior to that of 1900. Moreover, as the making of collars and cuffs is carried on conjointly with the making of shirts by many of the big manufacturers, it is not easy to make a satisfactory arrangement of such data as may be obtainable. Of all the statistics ever published, however, those of the census bureau have met with the most favorable reception from all.

According to these figures, the total value of the collar and cuff product of the United States for the year ending June, 1900, was \$9,077,700, of which amount \$8,073,271, or 89½ per cent., was made at Troy, and 99.4 per cent. in the State of New York. During the same year no less than 10,086,045 dozen collars and cuffs were made in the United States, of which number 8,881,400 dozen were made in Troy, while of the 17,115 workmen who depended upon this industry for their support the 14,822 who resided in Troy draw \$4,956,427 in wages out of the total amount of wages paid in this industry in the United States, \$5,658,969. The importance of the industry to the city of Troy is further indicated by the fact that, according to the same census reports, of the 21,564 wage earners who made that city their home during that year, no less than 14,822, or fully 68.7 per cent., were employed in the collar and cuff factories.

Colla'tion. 1. In the canon law of the Anglican Church, the act of a bishop in appointing a clergyman to a benefice (whether rectory, vicarage, canonry, or prebend) when the living is in his own gift through lapse or otherwise. In such a case the combination of the act of presentation and admission or institution constitutes collation. In the Roman Catholic Church the word has much the same meaning when applied to the conferring of a benefice, except that some benefices are conferred by the bishop or some delegated ecclesiastic; others, and in a few cases only by special grant of the Pope, a king or an abbeſs. In several countries of Europe the right of conferring the higher ecclesiastical dignities is regulated by a concordat between the Holy See and the respective governments.

2. Collation, the name given to the restricted meal, sometimes permitted on fast days, usu-

ally food to the amount of about eight ounces or one fourth of an ordinary meal.

Col'lect (*Collecta*) in ecclesiastical language means a collection, as of alms, taken up during the church service; this is of apostolic origin, and St. Paul mentions the collections for the saints taken up on the first day of the week. Used in still another meaning it signified what collect still does in English, a brief prayer pronounced by the priest in celebrating Mass after the Gloria.

Collect or **Collect Pond**, a small lake in old New York. See **NEW YORK**.

Collec'tivism, a plan of social organization in which the means of production and distribution in a community would belong to the people collectively. The term is also applied to the theory that society should be so organized. In the collectivist commonwealth the people cooperatively organized would have full control of production and distribution. Collectivism does not involve the abolition of all private property, but only of private property in the means of production. Collectivism is considered by Socialists as the natural successor to the present social system, and is the form of organization which they seek to establish; hence the term collectivism is often used as synonymous with Socialism (q.v.).

Collector of the Port. See **CUSTOMS**.

Colleen Bawn, kōl'ēn bân, **The**, a noted play by Dion Boucicault. It was based on Gerald Griffin's novel 'The Collegians' (1828) and was first played 10 Sept. 1860. The novel was republished in 1861 as 'Colleen Bawn or the Collegian's Wife.'

College (Latin, *collegium*), in its primary sense, a body of colleagues, a corporation or society of persons invested with certain powers and rights, performing certain duties, or engaged in some common employment. In Great Britain and America some societies of physicians are called colleges. So, also, there are colleges of surgeons, a college of heralds, etc. Colleges of these kinds are usually incorporated or established by the supreme power of the state. The most familiar application of the term college in English is to a society of persons engaged in the pursuits of literature or science, including both professors and students. At first the students of the universities had no common bond of union, except that of study and discipline, and were lodged where they could find it convenient. Then hostels or boarding-houses were provided (principally by the religious orders, for the benefit of those of their own fraternity), in which the scholars lived under a certain superintendence. Charitable persons subsequently endowed these hostels that poor scholars might have free lodgings. The colleges of Oxford and Cambridge are academical institutions of this kind, each endowed with revenues of its own, and having fellows, students, and tutors, who live together under a head, in particular buildings. Each college is regulated by laws framed by its founder, with such modifications as have been deemed necessary to introduce from time to time. According to these laws, the head (variously styled master, principal, warden, rector, etc.), is either chosen by the fellows from their own number, or appointed

COLLEGE

by the crown or other authority. The fellows are graduates who receive special emoluments for a term of years, and are generally elected to the position on account of special scholarship; while the scholars, admitted as undergraduates, are either chosen from particular localities, schools, etc., or elected according to merit after free competition. There are also a number of ordinary students, all as a rule occupying chambers belonging to the college. The undergraduates receive their instruction chiefly from tutors, who are generally resident fellows. The colleges are subordinate to the university, and it is the university that confers degrees, and institutes and carries out the necessary examinations. Generally speaking, the term college implies an institution inferior to a university, so far at least as the right of conferring degrees is concerned; but in Scotland, Germany, and elsewhere there are no colleges such as those of Oxford and Cambridge, and the college or colleges in Scotland are simply edifices in which the teaching is carried on. Some modern colleges are called university colleges, either because equipped similarly to a university, or because connected with a university, and able to train students for degrees to be obtained from that university. Institutions for teaching theology are often called colleges, and some schools that train pupils for the universities, or give a good secondary education, are also so called.

In France there are university colleges or *facultés* in all large towns, besides *lycées*, corresponding to what are called, in Germany, *gymnasias*. Other institutions of a similar kind, that is, schools for secondary education, are called *colléges communaux*. These are public establishments aided by the communes, and subject to the direction of the public authorities. Besides these, there is the *Collège de France*, which deserves the name of a university. It was instituted in 1529 by Francis I., and here numerous professors, among whom there are always some of the most distinguished men, lecture publicly and gratuitously.

College, The American. *Its Place and Importance.*—The American college has no exact counterpart in the educational system of any other country, although its elements are derived from European systems, and in particular from Great Britain. And while it is true that the primary form of organization in our earliest colleges, such as Harvard, Yale, and Princeton, was inherited from the English University of Cambridge, still it was subjected to modification at the very beginning, to adapt the college to its community, and afterward it was progressively modified to assure close sympathy with the character of the growing American nation. The result is an institution with derived elements of composition, and in less degree of form, which has developed for itself an organization notably different from the old-world schools.

So the college, from the nature of its development, holds the central place in the historic growth of American higher education. It remains to-day the one repository and shelter of liberal education as distinguished from technical or commercial training, the only available foundation for the erection of universities containing faculties devoted to the maintenance of pure

learning, and the only institution which can furnish the preparation which is always desired, even though it is not yet generally exacted, by professional schools. Singularly enough, the relation of directive influence sustained to-day by our colleges to the university problem is not unlike the relation held in the Middle Ages by the inferior faculty of arts at the University of Paris to the affairs of the university as a whole. In both cases the college, or faculty of arts, appears as the preliminary instructor in the essentials of liberal education; this earlier education is recognized as the proper requisite for later study in the professional faculties; and in both cases the inferior faculty contains the germ of the higher university faculty of pure learning, the faculty of arts, sciences, and philosophy. The reason for this similarity is that the American college in this respect perpetuates and develops a fundamental tradition of liberal learning, which found its way from Paris through Oxford to Cambridge, and then from Cambridge to our shores. The parallel of our college history with the old-world history holds good in other important respects. Still, in order to understand the precise nature and unique influence of the college in American education, it is not necessary to trace the story of its development, for in its various forms of present organization it reveals the normal type which has been evolved, survivals of past stages of development, instances of variation and even of degeneration from the type, and interesting present experiments which foreshadow the future.

The Old-fashioned College.—The three commonly accepted divisions of education into primary, secondary and higher stages, while fully recognized in America, are not followed rigorously in organization. Primary education is more clearly separable from secondary than secondary from the higher or university stage. The chief cause for this partial blending of the secondary and higher stages is the college. However illogical and indefensible such a mixture may appear the historical outworking of this partial blending has been compelled by the exigencies of our history and has been fruitful in good results.

The American college, then, as contrasted with European schools, is a composite thing—partly secondary and partly higher in its organization. It consists regularly of a four-year course of study leading to the bachelor's degree. Up to the close of the Civil War (1861-5) it was mainly an institution of secondary education, with some anticipations of university studies toward the end of the course, which, however, were usually taught as rounding out the course of disciplinary education, rather than as subjects of free investigation. The average age of graduation was about 20. The maximum course of preparation in secondary schools was four years. In the better schools they studied Latin and Greek grammar, four books of Cæsar, six books of Virgil's *Æneid*, six orations of Cicero, three books of Xenophon's *Anabasis* and two of Homer's *Iliad*, together with arithmetic, plane geometry (not always complete) and algebra to, or at most through, quadratic equations. This the stronger colleges required for entrance; but many weaker ones were compelled to teach some of these preparatory studies in the first two years of the college course. With few

COLLEGE

and unimportant exceptions the four-year course consisted of prescribed studies, including English literature and rhetoric, Latin, Greek, mathematics, natural philosophy, chemistry, the elements of deductive logic, moral philosophy, and political economy, and often a little psychology and metaphysics. Perhaps some ancient or general history was added. French and German were sometimes scantily taught. At graduation the student received the degree of bachelor of arts, and then entered some professional school, or went into business or into teaching in the primary or secondary schools.

The College of To-day.—At the present time things are very different. The old four-year course, consisting entirely of a single set of prescribed studies leading to the one degree of bachelor of arts, has grown and branched in many ways. The better preparation now given in thousands of schools has enabled colleges to ask for somewhat higher entrance requirements and to exact them. The age of entrance has increased. In some quarters the increasing age of the students is shortening the course to three years, in order that young men may not be kept back too long from entering upon their professional studies. A generation ago a young man graduated at 20 or earlier without difficulty, and after two or three years in studying law or medicine he began to earn his living at 22 or 23. But to-day a college student is 22 years old at graduation, and if he studies law or medicine he must wait until he is 25 to begin earning his living. Accordingly boys are now passing in considerable numbers directly from secondary schools, which do not really complete their secondary education, to the professional schools. The problem is an economic one, and it is affecting college courses of study. One solution, to shorten the course to three years, has been advanced by President Eliot of Harvard, and three years is the length of the course in the undergraduate college established in connection with the Johns Hopkins University. Another proposal is to keep the four-year course and allow professional studies in the last year, thus enabling the student to save one year in the professional school. This experiment is being tried at Columbia. A third proposal is to keep the college course free from professional studies, but to give opportunities in the last year or the last two years to pursue liberal courses clearly underlying professional training, thus saving a year of professional study. This is the trend of recent experiments in Yale and Princeton. The one common consideration in favor of all these proposals is that a year is saved. Against the three-year course, it is argued that there is no need to abolish the four-year course in order to save a year. Against the admission of professional studies it is argued that work done in a professional school ought not to count toward two degrees representing two radically different things. Against the proposal to allow the liberal studies which most closely underlie the professions, it is argued that this is a half-way measure, after all.

Alterations in the Course.—The four-year course, however, no longer leads solely to the degree of bachelor of arts, and this old degree has been modified. With the founding of schools of science, aiming to give a modern form of liberal education based mainly on the

physical and natural sciences, the degree of bachelor of science came into use. Then intermediate courses were constituted, resting on Latin, the modern languages, history, philosophy, mathematics, and science, and thus the degree of bachelor of letters or bachelor of philosophy came into use. Sometimes the various courses in engineering were made four-year undergraduate courses with their degrees virtually rated as bachelor's degrees. Still other degrees of lesser importance came into vogue here and there to mark the completion of a four-year college course. The dispersing pressure of the newer studies and the practical demands of American life proved too strong to be held in form or to be kept out by the barriers of the old course of purely liberal studies with its single and definite degree, and new degrees were added to represent the attempted organization of newer tendencies. Compared with the old course such courses lack definiteness of structure. They aimed to realize new and imperfectly understood conceptions of education, and were composed of studies whose inner content was changing rapidly, or else were "half-and-half" forms of education, difficult to arrange in a system that promised stability, as in the case of studies leading to the bachelor of letters or bachelor of philosophy. A graver source of trouble was the admission of various engineering and other technical studies as parallel undergraduate courses. This tended to confuse in the minds of students the radical distinction between liberal and utilitarian ideals in education, and by the attractiveness of the "bread-and-butter" courses, to diminish the strength of the liberal studies. When in addition it is remembered that the newer courses, whether liberal, semi-liberal, or technical, exacted less from preparatory schools in actual quantity of school work necessary for entrance into college, it will be seen that the level of preparation for college was really lowered.

The present drift of opinion and action in colleges which offer more than one bachelor's degree is more reassuring than it was some 20 years ago. There is a noticeable and growing tendency to draw a sharp line between liberal and technical education and to retain undergraduate college education in liberal studies as the best foundation for technical studies, thus elevating the latter to a professional dignity comparable with law, medicine, and divinity. The more this conception prevails, the more will college courses in engineering be converted into graduate, or at least partially graduate courses. Independent schools of technology may continue to offer their courses to young students of college age, but where such schools have been associated as parts of colleges or universities the tendency to a clearer separation of technical from liberal studies seems likely to prevail.

Another hopeful tendency gradually gathering strength is to give the various bachelor's degrees more definite significance by making them stand for distinct types of liberal or semi-liberal education. First comes the academic course, attempting a general liberal education, consisting of classical and modern literatures, mathematics, and science, with historical, political and philosophical studies, and leading to the bachelor of arts degree. The second aims to represent a strictly modern culture predomi-

COLLEGE

nantly scientific in character, and culminating in the degree of bachelor of science. In this course technical aspects of the sciences taught tended to create a demand for strictly technological instruction. So schools of science do little save produce experts in the various mechanical and chemical arts and industries. Conscious of this difficulty, many schools of science have been giving larger place in the curriculum to some of the more available humanistic studies, especially French, German, and English. Economics, modern history, and even the elements of philosophy have found place. Some improvement has also been effected by increasing the entrance requirements in quantity of school work. But the course still suffers from an inner antagonism between technical and liberal impulses, and until it settles into a strictly technical form, or else comes to represent a strictly modern liberal culture, its stability cannot be regarded as assured. In the independent scientific schools, unassociated with colleges, it seems probable the course will keep or assume a highly technical form. But wherever it exists side by side with other bachelor's courses as a proposed representative of some form of liberal education, it will almost inevitably tend toward the ideal of a modern culture mainly scientific. But the process promises to be slow and difficult. For there is not only a financial risk, but a serious theoretical difficulty in realizing this form of liberal education. The antagonism between the technical and liberal impulses in the course seems very difficult to eliminate completely. For the utilitarian instinct of the time militates against devotion to the intellectual value of modern studies and tends more and more toward technical standards.

The third type of liberal college education is the intermediate course labeled with the degree of bachelor of letters or bachelor of philosophy. It differs from the other courses mainly in its treatment of the classical languages. To placate the practical spirit it drops Greek, but retains Latin both as an aid to general culture and as a help in learning the modern languages. Although indeterminate and intermediate, it serves a valuable end by providing many students, who do not care for the classical languages in their entirety, with a sufficiently liberal form of education to be of great service. Judged from the standpoint of the historical bachelor of arts course, it is a less general but still valuable culture. Judged from the standpoint of the bachelor of science course, it appears to escape the unhappy conflict between the technical and liberal impulses.

But some colleges, following the example of Harvard, have dealt with the bachelor degree very differently. The meaning of the degree has been radically altered, so as to represent the free selections made by the students themselves out of the range of liberal studies. In these colleges it no longer stands for the completion of a definite curriculum composed of a few clearly related central studies constituting a positive type. What it does stand for is not easy to define, because of the variation of practice in different colleges and the wide diversity of selection on the part of the student. In the undergraduate college connected with the Johns Hopkins University at Baltimore choice is regulated by prescribing moderately elastic groups of cognate studies, the student

being required to say which group he will choose. In Harvard College the student is allowed to choose what he prefers, subject to such limitations as the priority of elementary to advanced courses in any subject, and the coincidence in time of various courses. A Columbia student in his senior year may pursue his first year's course in law or medicine, and at the same time receive double credit for this work, both toward the degree of bachelor of arts and toward the professional degree of doctor of medicine or bachelor of laws.

Other Phases of Change.—To what extent the undergraduate collegian has become a university student is the real question around which a controversy of vital importance is raging.

The profound change indicated by external symptoms has been in progress since the Civil War, and is still working along toward its consummation. The difficult thing in analyzing this change is not merely to understand the change from a uniform to a multiform mode of life and organization, but to understand what is changing the old-fashioned American college. But even the old-fashioned colleges, while aiming to follow out a single course of study ending in a single degree of single meaning, did not succeed in exhibiting such close individual resemblance to each other as is to be found among the lycées of France, the public schools of England or the gymnasias of Germany. Many colleges really served as preparatory schools for larger and stronger colleges, and many so-called universities did not attain and in fact do not yet attain to the real, though less pretentious dignity of the better colleges. For the sake of simplicity then we discard from our consideration all except the better colleges which, when taken together, exhibit the dominant tendency.

How, then, have these better colleges changed? Speaking generally, they have changed in a way which reflects the diversified progress of the country, and yet they have had an important influence in leading and organizing the national progress. Then, too, the change is not merely a change of form, but of spirit. In the older days scarcely any college had as many as 400 or 500 students, and the range of studies was limited. The faculty of the college exercised a strong paternal anxiety and oversight on behalf of the morals and religion, as well as over the studies of the students. The authority of the president was almost patriarchal in character. Not highly developed insight into the problems of education, but plain common sense in governing students was the condition of a successful presidency. The range of studies has increased. With the strengthening of preparatory courses, the school preparation of students has improved, and at the same time their average age at entrance has risen. The number of professors has multiplied. The old-fashioned college professor, the man of moderate general scholarship and of austere yet kindly interest in the personal welfare of those he taught, still remains; but at his side has appeared the newer type of American college professor, the man of high special learning in some one subject or branch, who considers it his primary duty to investigate, his next duty to teach, and his least duty to exercise a personal care for the individual students. Perhaps the old type will be replaced

COLLEGE

by the new. Such a result, however, would not be an unmixed gain, and our finest college professors to-day endeavor to combine high special attainments as scholars with deep interest in the personal well-being of their students. The authority of the faculty is still sufficient, but is exercised differently. Student self-government is the order of the day, and the more this prevails the less is exercise of faculty authority found to be necessary. The presidents of our larger colleges, and even of many of the smaller, are becoming more and more administrative officers and less and less teachers. It is no doubt something of a loss that the students should not have the intimate personal acquaintance with the president enjoyed by students a generation ago, but mere numbers frequently make this impossible. Out-door sports have also entered to modify and improve the spirit of our academic life. They have developed their own evils, but at the same time have done wonders for the physical health of the students, the diminution of student disorders and the fostering of an intense *esprit de corps*. In the reaction from the asceticism of early college life there is little doubt athletics have gone too far. But the abuses of college athletics can be corrected, and are to some extent self-correcting.

Nearly all our colleges are avowedly or impliedly Christian. A respectable minority of them are Roman Catholic. The large majority are under Protestant influences, which are seldom denominational. The student is expected to attend certain religious exercises, such as morning prayers; but often all such attendance is voluntary. The religious life of the undergraduates finds its expression in various societies, which endeavor to promote the Christian fellowship and life of their members. While moral and religious convictions are freer and sometimes laxer than of old the Christian life in our colleges is real and pervasive.

As a rule the student is so absorbed by the scholastic, athletic, and miscellaneous activities of his college that he sees little outside social life. This is particularly true in colleges which enjoy truly academic seclusion amid rural surroundings, for here more than anywhere else is to be seen the natural unperturbed outworking of the undergraduate spirit.

Development of Elective Courses.—The non-scholastic aspects of our present college life are important in that they give tone to the whole picture, but they do not account for the great transformation which has been wrought, for that transformation is distinctly scholastic. It is caused by the increase of students, their better preparation and their greater age. The studies which made up the curriculum leading to the old bachelor of arts degree are now being completed before the end, sometimes by the middle of the college course. There is to-day no reason why a young man of 20 should not know as much as his father knew at 20. But at 20 his father had graduated with the bachelor of arts degree, whereas at 20 the son is only half way through his college course. As this fact forced itself upon the older and stronger colleges, experiments were made in granting a limited amount of elective freedom to students in the latter part of their course; first in the senior year and then in the junior year, until in some instances the whole four-

year course is now elective. In some colleges a student may obtain the bachelor of arts degree without studying any science, or he may omit his classics, or he may know nothing of philosophy. To-day the problem of the relation of prescribed to elective studies is a question of constant interest and perpetual readjustment. The solutions offered are many.

The first proposal, which has now scarcely an advocate, is plainly an impossible one. It is to insist on the old-fashioned four-year prescribed course. But the old-fashioned course cannot be restored, because it no longer suits our age. Young men will not go to college and remain there until the age of 22 years without some opportunity to exercise freedom of choice in their studies.

The second proposal is to constitute the undergraduate course entirely, or almost entirely, of elective studies. It is argued that when a young man is 18 or 19 years of age, he is old enough to choose his liberal studies, and that his own choice will be better for him individually than any prescription the wisest college faculty may make. The advocates of this view admit its dangers. They see the perils of incoherency and discontinuity in the choice of studies. They see that many students are influenced, not by the intrinsic value of the studies, but by their liking for this or that instructor, or the companionship of certain students, or for the easiness of certain crowded courses. Yet they argue that the college student must be free at some time, that his sense of responsibility will be developed the sooner he is compelled to choose for himself, and that he will have the stimulating and sobering consciousness that what he does is his own act and not the prescription of others for him. Those who oppose this view argue that the academic freedom here proposed belongs to university rather than to college students; that the American freshman is not a university student in the sense in which that term has been commonly understood in the educated world, because of his much shorter preparatory training, and his mental immaturity as compared with the English and Continental student. If, therefore, he is to be as well educated as they are, some of his time in college, the first two years at least, should be spent in perfecting his properly secondary education before entering upon that elective freedom which has a place, and a large place, in our present undergraduate courses.

A third proposal is a conservative modification of the one just mentioned. It is to prescribe groups of cognate studies with the object of concentrating attention on related subjects in that field which the student may prefer. The advantage claimed for this mode is that it allows the student to choose the field of study he likes, and then safeguards him against incoherency by requiring him to pursue a group of well-related courses in that field. The advocates of wider freedom object to this as fettering spontaneity of choice, as not recognizing the fact that there are many students for whom it is advantageous to choose a study here and there at will, as a piece of side work outside the chosen field of their activity. The objection to this plan of restricted groups and also to the plan of practically unrestricted freedom, is that it offers temptations to pre-

COLLEGE

mature specialization at the expense of liberal education.

Still another proposal remains to be considered. Its followers urge that the best type of liberal education is to be found in the historic academic course, which has been the centre and strength of American college life. They concede that other bachelor's courses may give a valuable education to many, provided these courses are consistently organized according to their own ideals. They hold that it is possible to ascertain with sufficient exactness just what studies ought to be prescribed as integral parts of these courses, and that the preliminary training given in these prescribed studies develops maturity in the young student and enables him to choose intelligently his later elective studies. At the present time, in their view, it is not wise to introduce elective studies until about the middle of the college course. These studies should be organized and related in a system, and connected with the underlying system of prescribed studies. The principle of freedom should be introduced gradually, not suddenly. A form of this view which finds a good deal of support is that elective studies should be introduced first of all in the form of extensions of subjects already studied by the student, in order that he may make his first experiment of choice in an area where he is most familiar. According to this view the second stage of elective studies should be the introduction of large general courses in leading subjects, accompanied by special courses for students of exceptional ability in special directions, and finally leading to as high a degree of specialization as the resources of the college will allow.

Modes of Instruction.—Instruction is still mainly conducted by recitation and lecture, the recitation finding its chief place in the earlier and the lecture in the later part of the course. For purposes of recitation the classes are divided into sections of 25 or 30 students, and the exercise is usually based on a definitely allotted portion of some standard text-book. Much has been done to improve the character of this exercise. The correction of mistakes, the attempt to lead the student to discover the cause of his mistakes, and the endeavor to teach the entire class through the performance of each individual, is the aim of the more skillful instructors. The professors most skilled in the art of conducting recitations, rather than those who depend wholly on lectures, leave the most abiding impression. While instruction by recitation continues with effectiveness in the latter part of the course, especially with smaller groups of students, yet instruction by lecture is the rule. The lecturer may have to face a class which enrolls as many students as the whole college contained a generation ago. He delivers his lecture, while those before him take notes, or as they listen, read a printed syllabus prepared for the use of the class, and add such jottings as may seem desirable. In many lecture courses the recitation is employed as an effective auxiliary.

But other forms of instruction find place. In all except elementary courses in science the laboratory plays a most important part, and even in lectures in introductory courses in physics, chemistry, or biology full experimental illustration is the rule. The library serves as a sort of laboratory for the humanistic studies.

Students are encouraged to learn the use of the college library as auxiliary to the regular exercises of the curriculum. Certain books are appointed as collateral reading, and the written examination at the end of the term often takes account of this outside reading. That prolonged reading, which gives such wide and assuring acquaintance with the important literature of any subject, is as yet unattempted in a really adequate degree.

The academic year is divided into two (sometimes three) terms. At the end of each term the student is required to pass a fairly rigorous set of written examinations. Oral examinations have largely disappeared. Very rarely a high record of attainment in recitations during the term entitles a student to exemption from examination. In awarding honors the old academic college confined itself almost entirely to general honors. Honors for general eminence still remain in most colleges. The rank list of the class at graduation either arranges the students in ordinal position (in which case the first honor-man still appears) or else divides the class into a series of groups arranged in order of general scholarly merit. In such cases the old first honor-man is one of the select few who constitute the highest group in the class. But special honors in particular studies, while not unknown in the past, are really a development of our time. Undoubtedly they have tended to increase the interest of abler students in their favorite studies. A student trying for special honors is, of course, specializing in some sense, though he is not ordinarily pursuing original research. He is rather enlarging and deepening his acquaintance with some one important subject, such as history or mathematics.

Student Life.—At 18 the typical student of the older eastern college has completed a four-year course in some secondary school. He finds near at hand a local entrance examination conducted by a representative of his intended college. The days and exact hours of examination and the examination papers are the same as for the examination held at the college. His answers are sent on to be marked and estimated. In a week or two he receives notice of his admission to the freshman class.

Having passed his entrance examinations, he is now entitled to secure rooms in one of the dormitories, or else to find quarters outside the college campus in town. In the following autumn his name is enrolled in the matriculation book and his student career begins. His newness and strangeness naturally pick him out for a good deal of notice on the part of the older students, especially those of the sophomore class. But these annoyances soon cease unless he be vain or "very fresh." The daily round of college exercises demands his attention, and in the class room he begins to pass through a process of attrition more beneficent in its spirit. Under the steady measuring gaze of the instructor, and the unuttered but very real judgment of his classmates who sit about him, he begins to measure himself and to be measured by college standards. He is learning something not down in the books! and what he is thus discovering is well pictured in the words of Prof. Hibben: "There is a fair field to all and no favor. Wealth does not make for a man nor the lack of it against him. The students live their lives

COLLEGE

upon one social level. There is a deep-seated intolerance of all snobbishness and pretension. The dictum of the 'varsity field, 'No grandstand playing!' obtains in all quarters of the undergraduate life. It signifies no cant in religion; no pedantry in scholarship; no affectation in manners; no pretense in friendship. This is the first and enduring lesson which the freshman must learn. He learns and he forgets many other lessons, but this must be held in lively remembrance until it has become a second nature." His college comradeship continues and constitutes his social world. Day after day, term after term, they are thrown together in all the relationships of student life. Truly the American collegian is brimful of the "gregarious instinct."

In addition to this ever-present gregarious comradeship which environs and inspires him, our entering freshman finds the deeper intimacies of close individual friendship. As a matter of course he has some one most intimate friend, generally his room-mate or "chum." Side by side they mingle with their fellows. They stand together and, it may be, they fall together, and then rise together. And thus the class is paired off, and yet not to the lessening of the deep class fellowship. Here indeed is a form of communism, temporary and local, but most intense. They freely use things in common, not excepting the property of the college. They are welcome to enter each others' rooms at pleasure and use their friends' tobacco and stationery, or to borrow such articles of furniture and bric-a-brac as will brighten their own rooms for some special occasion. Money, however, stands on a different basis from other valuables. It is freely loaned for an indefinite time, but is strictly repaid. A student who lends his fellow money at interest cannot live in a college community.

Our student, unless he is an unusual recluse, takes some part in athletics. If he is not able to win a place on the football team or baseball nine or crew, which represents his *alma mater* in intercollegiate contests, he is very likely to be found playing ball in some organization improvised for the day, or trying his hand at tennis or golf. The bicycle is a necessity of his life, and on it he rides to recitations and lectures, to his meals and to the athletic field.

He has still other interests outside the curriculum. He may be a member of the voluntary religious society of the students. Perhaps he gets a place on the glee club or dramatic club. He may become one of the editors of the daily college paper or of the monthly literary magazine. Perhaps he is manager or assistant business manager for one or another undergraduate organization. Then there are the whist clubs and time-consuming chess clubs. There are also circles for outside reading and discussion springing up around the course of study, as well as the societies which train in speaking and debating. Perhaps he may win the distinction of representing his college in an intercollegiate debate, and success in intercollegiate debating is highly coveted. The contestants are greatly honored, for debating and athletics form the principal bond of union between the different colleges and give to their participants intercollegiate distinction.

Until the student passes out of freshman

year, he is not always free to choose what kind of clothes he will wear. In some colleges freshmen are not allowed to wear the colors, except on rare occasions. But as soon as he becomes a sophomore he is free to do as he likes. Then he and his classmates suddenly appear wearing various hats, picturesque and often grotesque in appearance, and revel particularly in golfing suits. Toward the close of the course their daily dress becomes more conventional, though the universal interest in athletics continues to affect the student mode to the end. He has other amusements besides athletics, and these again are found in the student circle. His briarwood pipe goes with him almost everywhere. In the evening, when the work of the scholastic day is done, he sits with his comrades at an unconventional "smoker," or else they may gather round the table of some restaurant with pipe and "stein"; for the American student who drinks at all prefers beer to either wine or whiskey. At such evening sessions the different phases of student politics are discussed again and again. College songs are sung, the air being carried in that sonorous baritone which is the dominant sound in all our student music. Tales and jests fill out the hour. At the end the college cheer is given as the men start strolling homeward, singing as they go. Arrived on the campus they disperse, and their good-night calls echo from the doors and windows of the different dormitories. And so the day ends where it began; within that closed circle where every student lives in "shouting distance" of the others.

Our former freshman is getting on bravely toward the end of his course. The closing months of senior year pass swiftly. His class procession is preparing to march out into the world, and there take its place as a higher order of freshmen in the long file of the classes of alumni advancing with their thinning ranks toward middle manhood and beyond,—and when commencement is over his undergraduate life is ended.

What has he acquired in the four years? At least some insight into the terms and commonplaces of liberal learning and some discipline in the central categories of knowledge, some moral training acquired in the punctual performance of perhaps unwelcome daily duty and some reverence for things intellectual and spiritual. He is not only a very different man from what he was when he entered, but very different from what he could have become had he not entered. He is wiser socially. He is becoming cosmopolitan. Awkwardness, personal eccentricity, conceit, diffidence, and all that is callow or forward or perverse have been taken from him, so far as the ceaseless attrition of his fellow-students and professors has touched him. He has been unconsciously developed into the genuine collegian. He is still frank and unconventional. But he has become more tolerant, better balanced, more cultivated, and more open-minded, and thus better able to direct himself and others. It is little wonder his student affiliations last. As he goes out to take his place among the thousands of his fellow alumni it is natural that his and their filial devotion to their academic mother should last through life. No matter what university he may subsequently attend, here or abroad, his college allegiance

COLLEGE

remains unshaken. It is this which explains the active interest shown by our alumni. In the best sense they advertise their college to the public, and it is to their exertions the recent rapid advancement of many of our colleges is largely due.

Organisation and Administration. — The form of government is simple. A college corporation, legally considered, consists of a body of men who have obtained the charter and who hold and administer the property. Where a particular State has established a college or even a university, which regularly includes a college, the members of the corporation are commonly styled regents, and are appointed by the State to hold office for a limited term of years. But most colleges have been established as private corporations. In this case the title is vested in a board of trustees, sometimes composed of members who hold office for life, or else composed of these associated with others who are elected for a term of years. Boards of trustees holding office for life usually constitute a close corporation, electing their own successors as vacancies occur. The two chief functions of such governing bodies, whether known as regents or trustees or by any other name, are to safeguard the intent of the charter and to manage the property. They give stability to our college system. To carry out the main purpose for which the charter was obtained they create a faculty of professors and instructors and entrust the general headship to a president. The president and professors usually hold office for life. In some places provision is made for the retirement of professors on pensions as they grow old. Instructors and sometimes assistant professors are appointed for a limited time, such appointments being subject to renewal or promotion. In the larger colleges the president is assisted in his administrative work by one or more deans. By immemorial tradition the president and faculty are charged with the conduct of the entire instruction and discipline. They have the power to admit and dismiss students. The conferring of degrees belongs to the corporation, but this power is almost invariably exercised according to recommendations made by the faculty. Honorary degrees, however, are sometimes given by the trustees or regents on their own initiative.

In State colleges the income is derived from taxation; in others from endowments, often supplemented by annual subscriptions for special purposes. But the private colleges are cut off from dependence on the State, and have to rely on private gifts. This stream of private liberality flows almost unceasingly. The fact that many colleges are integral parts of real or so-called universities makes it difficult to say how much the specifically collegiate endowments and incomes amount to. But a few significant facts may be mentioned. No college president, unless he is at the same time the president of a university, receives as high a salary as \$10,000 annually. He is more likely to receive \$4,000, \$5,000, or \$6,000. While \$2,000 is considered a good professor's salary in small colleges, \$3,000 is a usual salary in the larger colleges, while few professors receive more than \$4,000.

The expenses of individual students vary greatly. In some places there is no charge for tuition; in others they must pay as much as

\$100 or \$150. In little country colleges the total cost for a year often falls within \$300; in the larger old eastern colleges, drawing patronage from all parts of the land, the student who must pay all his bills and receives no aid in the form of a scholarship can hardly get along with less than \$600 or \$700, exclusive of his expenses in the summer vacation. The average expenses in some of the oldest colleges, according to tables prepared by successive senior classes, is higher than this, running up to \$800 or \$900, or even more. But these institutions afford the student of limited means multiplied opportunities for self-help. Moreover many colleges possess scholarships which are open to able students who need temporary pecuniary help. The young American of narrow means, if he be of fair ability and industry, can almost always manage to find his way through college.

The College is American.—The college lies very close to the people. Distinctions of caste may manifest themselves occasionally, and yet the college is stoutly and we believe permanently democratic. Its relation to the better side of our national life has been profoundly intimate from the beginning. The graduates of Harvard and Yale in New England, of Princeton and Columbia in the Middle States, and of the College of William and Mary in Virginia contributed powerfully to the formation of our republic. Edmund Burke attributed the "intractable spirit" of the Americans to "their education," and by this he meant the college education. "The colleges," wrote President Stiles, of Yale shortly after the Revolution, "have been of signal advantage in the present day. When Great Britain withdrew all her wisdom from America this revolution found above 2,000 in New England only, who had been educated in the colonies, intermingling with the people and communicating knowledge among them." John Adams of Harvard delighted to find in President Witherspoon of Princeton "as high a son of liberty as any in America." Hampden-Sidney College in Virginia, founded about the time of the Revolution, incorporated in its charter the following clause: "In order to preserve in the minds of the students that sacred love and attachment which they should ever bear to the principles of the ever-glorious Revolution, the greatest care and caution shall be used in selecting such professors and masters, to the end that no person shall be so elected unless the uniform tenor of his conduct manifest to the world his sincere affection for the liberty and independence of the United States of America." And from that day to this the collegiate spirit and the national spirit have been at one. Rightly, indeed, did our appreciative French visitor, Baron Pierre de Coubertin, perceive that the place to find "the true Americans" is in our college halls; "*les vrais Americains, la base de la nation, l'espoir de l'avenir.*" Scarcely one in a hundred of our white male youth of college age has gone to college. But this scanty contingent has furnished one half of all the presidents of the United States, most of the justices of the supreme court, not far from one half of the Cabinet and of the national Senate, and almost a third of the House of Representatives. No other single class of equal numbers has been so potent in our national life.

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COLLEGE PARK — COLLEGES FOR TEACHERS

College Park, Md., a village in Prince George County, on the Baltimore & O. R.R., about nine miles northeast of Washington, D. C. It is a favorite suburb of Washington, and contains an experiment station and the Maryland Agricultural College. Pop. 325.

College of the City of New York, The, originally entitled the Free Academy, was established in 1848, for boys, by the board of education of New York City. In 1854 the legislature of the State passed a law endowing the school with collegiate powers and privileges; and in 1866 the name was changed to that of "The College of the City of New York." The institute possesses all the powers and privileges of a college pursuant to the revised statutes of the State of New York relative to colleges, visitation of regents of the university, granting of degrees, etc. Prior to 1882 one condition for admission was attendance for at least one year at the public schools of the city. In the year 1882 the legislature repealed so much of the statute as related to this condition, and now the college is open to all young men of the city of proper age and preparation. Instruction, the use of text-books, and apparatus are free. The courses of study extend over seven years, three academic or preparatory and four collegiate years. The number of students in attendance in 1903, 2,200; number of graduates, 200; volumes in library, 36,876. Purchases of books are made with the income of the Seth M. Grosvenor fund of \$30,000 and the Ephraim Holbrook fund of \$5,000. In 1903 plans were perfected for the removal of the institution from 23d Street and Lexington Avenue to Washington Heights, in the upper part of the city. The new buildings will eclipse any in the United States, if not in the world.

Collège de France, kōl-lāzh dè frāns, a celebrated institution founded by Francis I. in 1530, originally a *Collège de Trois Langues* or a college in which would be taught Greek, Hebrew, and Latin, is a very important educational institution, now giving instruction over a very wide field of literature, history, and science. It is independent of the University of France, is under the direct supervision of the minister of public instruction, and is supported by the government. As in the Sorbonne, the lectures are gratuitous, and for the most part are designed to attract auditors older than ordinary university students. The college comprises two faculties, one literary, one scientific; each has about 20 professors. Among the professors have been some of the most distinguished scholars and scientists in France, such as Laboulaye, Gaston de Paris, Saint-Hilaire, Ramus, Rollin, and others.

College Fraternities. See GREEK LETTER SOCIETIES.

Colleges, Land Grant, colleges established and maintained in whole or in part by the Land Grant Act of 2 July 1862. Justin S. Morrill, a representative from Vermont, introduced in Congress the first bill asking that grants of government land be donated for the purpose of aiding in the education of the people, in scientific and technical subjects. This bill, introduced in the lower House 14 Dec. 1857, authorized the establishment of colleges of agriculture and mechanical arts in all States, and provided for the support of said colleges, 20,000

acres of land for each senator and representative. The bill passed both Houses but was vetoed by President Buchanan. In December 1861 Mr. Morrill introduced a new bill, bestowing 30,000 acres of land for each member of Congress for the establishment and maintenance of industrial colleges. Ben Wade, of Ohio, introduced the bill in the Senate. The House committee on public lands made an adverse report, but the bill passed both Houses and was approved by President Lincoln 2 July 1862. This act gave to the cause of industrial education 30,000 acres of land for each senator and representative in Congress to which the States were entitled by apportionment of the census of 1860, or in all, about 13,000,000 acres of land for educational purposes. The act was entitled "An act donating public lands to the several States and Territories who may provide colleges for the benefit of agriculture and mechanical arts." The object of the act is expressed as follows:

"The endowment, support and maintenance of at least one college where the leading objects shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

In 1889 Mr. Morrill and others began to form plans to secure another appropriation, and Mr. Morrill introduced another bill in Congress, providing that there shall be appropriated annually to each State out of the funds arising from the sale of public lands, the sum of \$15,000 for the year ending 30 June 1890, and an annual increase by the additional sum of \$1,000 to such appropriation for 10 years thereafter until the appropriation shall become \$25,000, at which figure it shall remain fixed.

The bill passed both Houses and was approved by President Harrison 30 Aug. 1890. The act says that this appropriation shall be applied "only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural and economic science, with special reference to their applications to the industries of life, and to the facilities for such instruction." Provision was made at this time for separate institutions for white and colored students in such States as desired to make this arrangement.

The reports for the year ending 30 June 1901, received by the Commissioner of Education from the presidents of the land grant colleges, show that the States have received 10,320,843 acres of land, of which 1,030,572 acres remain unsold. The invested funds from the sale of the land amount to \$10,806,780, yielding an income of 6.3 per cent. Unsold lands are held by 17 States.

The total number of students in the agricultural and mechanical departments was 29,950, of which number 23,872 were men and 6,978 women. (For information in detail about each land grant college, consult 'Report of Commissioner of Education,' Vol. II. 1901.)

Colleges for Teachers, or colleges in which are special departments for the study of the history of education, psychology as applied

COLLEGES FOR TEACHERS

to teaching, pedagogy, and all subjects bearing upon methods of instruction.

To the English schoolmaster, Richard Mulcaster, is given the credit of being one of the first, if not the first, to propose a college for the training of teachers. He classified his chief reasons for desiring the establishment of such a school under four heads: (1) Importance of the work, it will make or mar the State; (2) The great numbers who are to teach and be taught; (3) Need of the profession of teaching, professors must be trained; (4) That teachers may acquire wisdom in arranging and presenting subjects, in economizing time, and that they may attain staidness of demeanor.

Instruction in the science and art of teaching was included in the university scheme that was proposed for Columbia College in 1858, but then without avail. Again President Barnard urged the same plan, which he now worked out much more fully, upon the trustees of the same college in 1881 and 1882. The next step forward was the organization in New York, in 1888, of Teachers' College, which was chartered the following year. While this college was organized outside of the Columbia system, it was still under the control, in great part, of Columbia men, and was loosely affiliated with the college. The last step in the evolution came in 1898, when Teachers' College was made an integral part of the educational system of Columbia University. The president of Columbia is president also of the college, and the university professors of philosophy and education and of psychology are members of its faculty, while the college is represented in the university council by its dean and an elected representative. The college, however, continues its own separate organization, having its own independent board of trustees, which is charged with the sole financial responsibility of its management.

Teachers' College is the professional school of Columbia University for the study of education and the training of teachers, ranking with the schools of law, medicine, and applied science. The university accepts courses in education as part of the requirement for the degrees of A.B., A.M., and Ph.D.; while graduate students who prefer to devote their entire time to professional study may become candidates for the higher diploma of the college. The college diploma is conferred upon students who have successfully completed some one of the general courses, and a departmental diploma upon those who have fitted themselves for particular branches of school work. Undergraduate students of Columbia and Barnard colleges may, if they desire, obtain the diploma of Teachers' College at the same time that they receive the degree of bachelor of arts. The Horace Mann school, fully equipped with kindergarten, elementary, and secondary classes, is maintained by Teachers' College as a school of observation and practice.

These are the undergraduate courses: Secondary course leading to the degree of A.B. and the college diploma; general course leading to the college diploma in elementary teaching; general course leading to the college diploma in kindergarten teaching. Then there are several courses leading to the college diploma in art, domestic art, domestic science, and manual training. Candi-

dates for the first of these courses must be either college graduates or candidates for the degree of A.B. in Columbia University. There is a combined course of study prescribed for the degree of A.B. in Columbia University and the diploma of Teachers' College; but particulars must here be omitted. Graduate work is also well developed. For the year 1898-9 the teaching staff counted more than 60 persons.

New York University School of Pedagogy, established in 1890, aims to furnish graduate work equal in range to other professional schools. The school is an organic part of the university, having its own dean and faculty. More definitely, its aim is declared to be to furnish thorough and complete professional training for teachers. The plan of the school places it upon the same basis as that of the best schools of law, medicine, and theology. The work is of distinctively university grade, and graduates of colleges and normal schools, and others of equal experience and maturity, may find in this school opportunity for the thorough study of higher pedagogy. In 1898-9, the instruction was distributed in four major and eight minor courses, namely, history of education; physiological and experimental psychology; analytical psychology; history of philosophy; physiological pedagogics; elements of pedagogy; comparative study of national school systems; æsthetics in relation to education; sociology in relation to education; institutes of pedagogy, ethics, school organization, management, and administration. Special facilities for research are offered to the seminaries. The degree of master of pedagogy is conferred upon candidates who have completed five of the foregoing courses, three of them majors; the degree of doctor of pedagogy, upon candidates who have completed the four major and five of the minor courses. The school does not attempt undergraduate work. There is no practice teaching, but opportunity is given for the critical observation of selected schools. The staff includes 10 persons.

Clark University, opened in 1889, has given much attention to education from the first, and the subject has now been made a sub-department in the department of psychology, in which a minor may be taken for the degree of doctor of philosophy. The work is intended to meet the needs of those intending to teach some other specialty than education, but who wish a general survey of the history, present state, methods, and recent advances in the field of university, professional, and technical education, and of those who desire to become professors of pedagogy, or heads of instruction in normal schools, superintendents, or to become professional experts in the work of education. The program for the year 1899 included (1) child study, educational psychology, and school hygiene; (2) principles of education, history of education and reforms, methods, devices, apparatus, etc.; (3) organization of schools in different countries, typical schools and special foundations, motor education, including manual training, physical education, etc., moral education, and ideals. Great stress is placed on original investigation. The president, Dr. G. Stanley Hall, has been from the first the leader of the child study movement in the United States. 'The Pedagogical Seminary,' edited

COLLEGES FOR WOMEN

by him, is the organ of the educational department of the university. It is an international record of educational research and literature, institutions, and progress, and is devoted to the highest interests of education of all grades. One of its most valuable features is its digests of meritorious contributions to educational literature.

The department of pedagogy in the University of Chicago has as its primary aim to train competent specialists for the broad and scientific treatment of educational problems. The courses fall under three heads: Psychology and related work, educational theory, and the best methods of teaching the various branches. Stress is laid upon the relation of pedagogy to other subjects, and courses are offered in the proper departments in which the methodology of such subjects is employed. For the year 1898-9 such courses were offered in history, sociology, and anthropology, in the English, German, and Latin languages and literatures, in mathematics, and in geology. The courses in educational theory are preceded by the introductory courses in psychology, ethics, and logic, given in the department of philosophy.

The University of Chicago has also established a college for teachers on a somewhat novel plan. This institution, which was founded in October 1898, is an outgrowth of the class study department of the extension division of the university. It is a "downtown" college, and aims to provide instruction of high grade for busy people; or, more definitely, "for any and all persons qualified to do the work, who are so engaged by other imperative duties as to make continuous attendance at the other colleges of the university impracticable." The work of the new college is of the same grades as that of the other colleges of the university. Students may take much or little, according to their ability and wishes, but when the requirements have been met, the work is crowned with a degree. The school aims at scientific, cultural, and disciplinary results. It distinctly denies that it is in any sense a normal school. Moreover, while it is not exclusively a teachers' school, the college, nevertheless, emphasizes instruction suitable to the special needs of teachers sufficiently to justify its name. The distinctively pedagogical teaching, like all the teaching, looks to knowledge and scientific training rather than to practical applications. At the close of its first year of life the outlook is an encouraging one. See UNIVERSITY OF CHICAGO.

The University of Wisconsin school of education is an expansion of the former department of education. The four main lines of instruction are the history, the philosophy, the science, and the practice of education. The school aims to afford practical and healthful instruction to intending teachers, professors, principals, and superintendents, and to those students who desire to pursue studies and investigations in the science of education.

Colleges for Women. Three types of the collegiate education for women in the United States prevail. The first in time and in popularity is known as coeducation; the second, as separate education; and the third, as co-ordination in education. Under the first form, men and women are educated together under identical

conditions; under the second, women are educated by colleges founded and administered for them as women; under the third, there are established in the same university two colleges, one for men and one for women. The third form is subject, however, to considerable varieties in administration.

The first college founded for both men and women was Oberlin. Its charter was granted in 1834. The college was the result of the philanthropic and missionary movements of the first decades of the last century. The town and the Institute, as the college was called for about a score of years, were closely allied. In the first circular published regarding the institution, it was said that among its great objects was the extending of the benefits of the most useful education to "both sexes." "The elevation of female character" was also noted as a purpose. The giving of a college education to both men and women together was not a primary thought. The primary thought was to offer the best education to women. The conditions obliged the giving of the education to both sexes upon equal terms. In the first year of the college, 40 women were enrolled. Few of them were fitted, however, to pursue college studies. A preparatory department was formed. In 1837 four women offered themselves as candidates for college rank. Their classification was more or less irregular. At the commencement of 1841 three women received a degree, the first women to receive a degree in arts in the United States. For about a score of years Oberlin alone received women into its classes on the same terms, substantially, as those on which it received men.

The second step in the education of men and women together was taken 20 years after the beginning was made at Oberlin in another Ohio town. Antioch College, in Yellow Springs, was founded by Horace Mann in 1852. In his inaugural address Horace Mann declared himself heartily in favor of what is now known as coeducation. He affirms that coeducation is the only method to be pursued, at least for many years, on the ground of its relative inexpensiveness. He believes that social intercourse between young men and women will prove advantageous to each, preventing manners from becoming rude and sentiments coarse. He believes that the peril of forming undesirable attachments is less under academic than under ordinary social conditions.

The beginning thus made in two Ohio colleges advanced rapidly. Its chief field of growth lay in the universities founded by the various States. In 1856 Iowa, in 1866 Kansas, in 1868 Minnesota, in 1871 Nebraska, founded universities for both men and women. The University of Indiana, founded in 1820, was in 1868 opened to women. The University of Michigan, of Illinois, of California, of Missouri, were open to women in 1870, and the Ohio State University three years after. In 1874 Wisconsin adopted complete coeducation. At the present time every State university, excepting Virginia, Georgia, and Louisiana, is open to women.

The older parts of the country approached the question of the education of women through the establishment of new colleges for them. It was easier to found colleges for women than to adjust colleges already organized for men, and

COLLEGES FOR WOMEN

whose conditions and traditions were established, to the admission of women. Yet Middlebury, Colby, and other colleges, were opened to them; and Boston University, Bates in Maine, and Cornell in New York were coeducational either in the beginning or soon after. The founders of the four more eminent colleges for women in the seventh and eighth decades of the 19th century were moved by the same purpose. They desired to establish institutions which should give to women an education as good as the older colleges were giving to men. The purposes of Matthew Vassar, of Sophia Smith, of Henry J. Durant, the founder of Wellesley, and of Dr. Joseph W. Taylor, the founder of Bryn Mawr, were alike slow in fruition. In the year 1845, at the age of 53, Matthew Vassar decided to devote a large portion of his estate to some benevolent purpose. It was not until 20 years after that Vassar College was opened to students. In the year that Vassar received its act of incorporation Sophia Smith began to think of the establishing of a college for women. The college was incorporated in 1871 and opened for students in 1875. In 1864 Henry J. Durant, losing by death an only son, determined to use a part of his estate in philanthropy. In 1870 the institution was incorporated as the Wellesley Female Seminary; three years after the name was changed to Wellesley College, and in 1877 the college was authorized to grant degrees. For many years Dr. Joseph W. Taylor considered the question of devoting his estate to the education of women.

In these endeavors for the higher education of women help was derived from a foundation laid at Elmira in the year 1855. But the foundation was not adequate for offering the training which women were desirous of receiving. Its chief value, therefore, lay in the incentive it gave rather than in its actual educational achievement.

The general purpose and conditions under which all these foundations were laid are well indicated in an address given by Matthew Vassar to the trustees of his college in June 1864 at the time when the question of the election of professors was being discussed.

"It is my hope—it was my only hope and desire—indeed, it has been the main incentive to all I have already done, or may hereafter do, or hope to do, to inaugurate a new era in the history and life of woman. The attempt you are to aid me in making fails wholly of its point if it be not an advance, and a decided advance. I wish to give one sex all the advantages too long monopolized by the other. Ours is, and is to be, an institution for women—not men. In all its labors, positions, rewards, and hopes, the idea is the development and exposition, and the marshaling to the front and the preferment of women—of their powers on every side, demonstrative of their equality with men—demonstrative, indeed, of such capacities as in certain fixed directions surpass those of men. This, I conceive, may be fully accomplished within the rational limits of true womanliness, and without the slightest hazard to the attractiveness of her character. We are indeed already defeated before we commence if such development be in the least dangerous to the dearest attributes of her sex. We are not the less defeated if it be hazardous for her to avail herself of her highest educated powers when

that point is gained. We are defeated if we start upon the assumption that she has no powers save those she may derive, or imitate, from the other sex. We are defeated if we recognize the idea that she may not, with every propriety, contribute to the world the benefits of matured faculties which education evokes. We are especially defeated if we fail to express, by our acts, our practical belief in her pre-eminent powers as an instructor of her own sex."*

The third type of the collegiate education of women is known as co-ordination. It represents the inclusion in, or the alliance of, a college for women with a college for men. Certain communities, in their desire to promote the education of women, and in their unwillingness to duplicate educational equipment, have established colleges for women as an annex to, or as institutions parallel with, the institutions founded at an earlier date for men. This method represents the English tradition. Girton, at Cambridge, existed nine years before the foundation of the Society for the Collegiate Instruction of Women, organized in Cambridge in 1879. The more conspicuous of these colleges are Radcliffe, affiliated with Harvard; Barnard, affiliated with Columbia; the Woman's College of Brown University, the College for Women of Western Reserve University of Cleveland, and the H. Sophia Newcomb College, affiliated with Tulane University. The intramural administration of these colleges differs from each other. In Radcliffe, Barnard, and Brown the larger part of the instruction is given by members of the faculty of the older college for men. In the College for Women of Western Reserve University a distinct faculty is established which is co-ordinate with the faculty of the college for men—Adelbert—of the same university.

Colleges of each of these three types have special advantages, and are subject to special disadvantages. Each apparently has come to occupy a permanent place in American education. Coeducation, however, is by far the more popular. About nine tenths of all colleges are coeducational institutions. The number of degrees conferred on women in all American colleges in the last year was about 3,700. The more common degrees are A.B., Ph.B., B.L., and B.S., of which A.B. is conferred on about five eighths of all candidates.

CHARLES F. THWING,
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Cleveland.*

Collegeville, Minn., village in Stearns County, on the Great N. R.R., nine miles northwest of St. Cloud. St. John's Abbey and St. John's University, in charge of members of the order of St. Benedict, are the chief parts of the village. The university was opened in 1867. The number of students is greater than the number of inhabitants of the village.

Collegeville, Pa., a borough in Montgomery County. It is situated on the Perkimon River, the Philadelphia & R. R.R., and is 27 miles northwest of Philadelphia. Ursinus College, established in 1870, is an institution belonging to the German Reformed Church. The manufactures are iron machinery and boiler-making. Pop. 700.

* 'Vassar College and Its Founder,' p. 100.

COLLEGIATE ATHLETICS — COLLIER

Collegiate Athletics. See EDUCATIONAL ATHLETICS.

Colles, kōlz, Christopher, American philosophic adventurer: b. Ireland about 1738; d. New York 1821. In 1765 he set out, a wanderer from his native land, and we find him in Philadelphia in 1772, delivering illustrated lectures upon pneumatics. He is reported to have been the first individual who undertook to build a steam engine in this country. In April 1774 he proposed to erect a reservoir for the purpose of conveying water through the several streets of the city of New York. His proposals were "read and referred." In 1775 he delivered lectures on gunnery, and was further employed in giving instruction to the artillery department of the American army in the principles of projectiles. Colles was the first person who suggested canals and improvements to connect Lake Ontario with the Hudson. According to the records of the assembly of New York, in November 1784 he presented a memorial on the subject, and in April following a favorable report was made thereon. In 1808 Colles published an elaborate pamphlet on the interests of the United New York, and in 1789 published a book of roads through New York.

Col'lie, the domestic sheep-tending dog developed in Scotland, and for a long time bred there exclusively, but now known in all parts of the world. It is one of the most beautiful, and perhaps the most intelligent of all dogs, and many anecdotes are told illustrative of its sagacity. Collies have for hundreds of years aided the Scotch shepherds in caring for their flocks, under all conditions and in all sorts of weather. To meet the inclemency of stormy days and cold nights, these dogs have acquired an outer coat of thick, rough hair, black or black-and-tan in color. It has an undercoat so close and soft that, even when it is parted, one can scarcely see the dog's skin. The chief points of these dogs are: long, sharp heads; bright, keen eyes, set rather close together; small ears, drooping at the tips; a full ruff of hair around the neck; strong, wiry frames; and rounded feet. Their intelligence is remarkable—almost human; and their affection so constant that they have been known to die of grief after the death of a master.

The collie measures from 22 to 24 inches at the shoulder, and weighs generally from 45 to 60 pounds. He is as alert as a fox, and as fleet as a deer. In fact, no dog, except the greyhound can excel him in speed and grace of movement, and it is safe to state that no dog is so faithful and trustworthy a companion to man, for the collie gives implicit obedience and unfaltering loyalty to his master, and will yield his life rather than desert his master's charge. This it is that makes him invaluable as a sheep-dog. Detailed information in regard to the collie may be found in most books relating to dogs (q.v.), and special books treating of him from the point of view of both the shepherd and the fancier are accessible. Consult Lee, 'Collie or Sheep-Dog'; and Wickham, 'Practical Training of the Shepherd Dog.'

Collier, kōl'yēr, Ada Langworthy, American writer of verse: b. Iowa 1843. Her principal work is 'Lilith, the Legend of the First Woman' (1885).

Collier, Arthur, English philosopher: b. Langford Steeple, Wiltshire, 12 Oct. 1680; d. there 1732. He was educated at Pembroke and Balliol colleges, Oxford, and in 1704 became rector of Langford, a living which had belonged successively to his great-grandfather, grandfather, and father, and which he retained till his death. In 1713 he published a work entitled 'Clavis Universalis,' in which he maintained both the non-existence and the impossibility of the existence of any objects external to the mind. Berkeley had three years before advanced incidentally his theory of the negation of an external world, but the two philosophers appear to have had no knowledge of each other, and it is certain that Collier meditated upon his opinion for 10 years before promulgating it. Though they developed simultaneously the first systematic scheme of absolute idealism, and though Collier was inferior to his contemporary rather in the graces of composition than in acuteness or method, yet the 'Clavis Universalis' attracted not the slightest attention in England. In Germany a copious and able abstract of its contents was given in 1717, in a supplemental volume of the 'Acta Eruditorum,' and it was quoted by Wolf, Bilfinger, and others. In 1756 a complete translation of it into German was made by Eschenbach. Thus rendered accessible in Germany, Collier has enjoyed among the thinkers of that country high repute for talent and originality, and the best comparative view of his doctrines and those of Berkeley is that given by Tennemann. Other publications of Collier were the 'Specimen of True Philosophy' (1713); and 'Logology' (1732). In religion he was an Arian, and also a high churchman on grounds which his associates could not understand.

Collier, H. Price, American writer: b. 25 May 1860. He is a son of R. L. Collier (q.v.) and was educated at Harvard. Entering the Unitarian ministry, he was for nine years in charge of churches in Hingham, Mass., and elsewhere, and during the Spanish-American war served as a naval officer. He has published 'Essays'; 'Mr. Picket Pin and His Friends'; 'America and the Americans from a French Point of View,' issued at first anonymously.

Collier, Jeremy, English bishop: b. Stow Qui, Cambridgeshire, 23 Sept. 1650; d. London 26 April 1726. He was educated at Caius College, Cambridge, entered the Anglican Church in 1677, and was rector of Ampton, Suffolk in 1679. The revolution of 1688 found in him a most zealous opponent, and he not only refused to take the oaths to the government of William and Mary, but came boldly forward in defense of his nonjuring principles, and subjected himself to repeated imprisonment, both for writings and other overt acts, which a more tyrannical government might easily have construed into treason. His political writings have almost been forgotten; but he wrote two other works, which have preserved his name, and prove him to have been a writer of distinguished ability. The one entitled 'Essays Upon Several Moral Subjects' (1697), is distinguished by learning and wit, and an easy flowing style; the other, entitled 'Short View of the Immorality and Profaneness of the English Stage' (1698), is unquestionably a masterpiece, and is still perhaps the best work written on

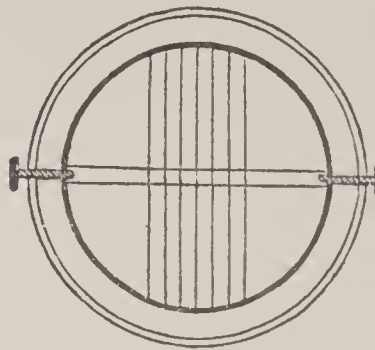
the subject. It enjoyed great popularity, notwithstanding the fierce opposition it encountered, especially from Congreve and Vanbrugh, and is said to have had the effect of greatly purifying both the sentiments and the language of the theatre. The only other work of Collier deserving of special notice is his 'Ecclesiastical History of Great Britain to the End of the Reign of Charles II.' (1708 and 1714). It cost him many years of labor, and displays much ability, but is strongly tinged with his nonjuring views.

Collier, John Payne, Shakespearean critic: b. London 11 Jan. 1789; d. Maidenhead 17 Sept. 1883. He wrote many critical articles in periodicals, published in 1820 his 'Poetical Decameron,' and thenceforward continued his editions of poems and plays, notably those of the less-known Elizabethan writers. His 'History of English Dramatic Poetry' appeared in 1831. He took great interest in and edited many publications for the Camden, Percy, and Shakespeare societies, and completed in 1844 an eight-volume edition of Shakespeare. In 1852 he professed to have discovered, on the margins of a copy of the second folio Shakespeare, bought from a second-hand bookseller, manuscript notes and emendations written in a 17th century hand. When these notes and emendations were published they became the subject of eager discussion by the critics, the best of whom were not disposed to set a high value on them, and in 1859 an examination of the volume convinced the British Museum authorities that the marginal notes were forgeries. Collier published a weak and inconclusive reply, in which he maintained their genuineness, and thenceforward he maintained complete silence on the matter. He continued to produce editions of English writers, among them Spenser, and also critical and autobiographical works. Among his papers were found indisputable proofs of a long series of literary forgeries. As a consequence suspicion has rested on all his work, and has obscured the real services he indisputably did to English literature.

Collier, Robert Laird, American Unitarian clergyman and writer: b. Salisbury, Md., 7 Aug. 1837; d. near Salisbury, England, 27 July, 1890. Starting in life as an itinerant Methodist preacher, he held prominent Unitarian pulpits in Chicago and Boston, and became noted as a preacher and lecturer. In later life he was London correspondent of the *New York Herald*. Besides religious writings he published 'Henry Irving, a Sketch and a Criticism'; 'English Home Life' (1885).

Collima'tion, Line of. In a measuring telescope there is placed at the focus of the eyepiece a system of spider-threads. In a transit instrument there are several vertical and two horizontal "wires," as shown in the diagram. In taking an observation the time at which the star passes behind each wire is noted. Taking the mean of these times, we obtain what is called the time for the "mean wire," an imaginary wire which would, if the adjustments were perfect, coincide with the middle vertical wire. The mean of these observations gives a better result than if only one central wire were used. The line of collimation is defined to be the straight line that joins the centre of the object-glass with the point of this imaginary vertical wire midway between the two horizontal wires. A

definition similar to that here given applies in other cases, in the case of the mural circle, for example, and in the case of instruments for terrestrial surveying.



Spider-lines.

The proper adjustment of the line of collimation of these instruments is one of the most important of the adjustments. In the case of the transit instrument, for instance, in observing the passage of a star, what is noted is practically the instant, according to the observatory clock, when the line joining the star and its image coincides with the line of collimation. The following is one of the conditions to be satisfied when the instrument is in perfect adjustment. The line of collimation must be perpendicular to the geometrical axis on which the telescope revolves, and will then describe a great circle. The framework that carries the spider-lines admits of several small movements for their adjustment. After the adjustment has been carefully made, however, there always remains a slight error, which is determined and allowed for in calculations under the name of the collimation error. Adjustments and corrections are similarly made in the other telescopes for measuring.

Collin, Heinrich Joseph von, hīn'řĭh yō'sēf fōn kōl'līn, Austrian dramatist and lyricist: b. Vienna 1771; d. 1811. He wrote several tragedies, mostly on antique themes; of these 'Regulus,' the first of the series, is the best. His powerful 'Songs for the Militia' (1809) gave him a high rank among the balladists of the war of liberation. Of his historical ballads, 'Kaiser Max on the Walls of St. Martin's' is best known.

Collin, Louis Joseph Raphael, loo ē zhō zēf rā-fā-ēl kōl lān, French figure and portrait painter: b. Paris. He studied under Cabanel, obtained a second-class medal in the Paris Salon in 1873, and the medal of the Legion of Honor in 1884. His 'Idyl' is one of his most admired works.

Collin d'Harleville, Jean François, zhōn frān-swā kōl lān dārl-vēl, French dramatist: b. 30 May 1755; d. 24 Feb. 1806. He worked a genuine vein of comedy, yet never slighted the moral side of conduct, and some of his plays still keep the stage. Notable among his works are 'The Old Bachelor,' his masterpiece (1793); and 'Castles in Spain' (1806).

Collingwood, Cuthbert, LORD, English admiral: b. Newcastle-upon-Tyne 26 Sept. 1750; d. at sea near Minorca 7 March 1810. He entered the royal navy in 1761, gradually rose in service, and became a close friend of Nelson. In 1799 he was made rear-admiral of the white. His most distinguished service was the part he bore in the great victory of Trafalgar, in which his gallant manner of bringing his ship (the 'Royal Sovereign') into action, and the skill and resolution with which he fought her, excited the personal admiration of Nelson himself, upon whose fall the command of the fleet devolved upon Collingwood as senior offi-

COLLINGWOOD—COLLINS

cer. He was promoted to be vice-admiral of the red, continued in his command of the fleet, and elevated to the peerage with the title of Baron Collingwood.

Collingwood, William Gershom, English writer and artist: b. 1854. He was educated at Liverpool College, and University College, Oxford. He first exhibited at the Royal Academy in 1880, while from 1881 to 1890 he was secretary to John Ruskin. He has published 'Limestone Alps of Savoy'; 'Art Teaching of Ruskin'; 'Life of Ruskin'; 'Thorstein of the Mere'; 'The Bondwoman'; 'Book of Coniston'; 'Saga-steads of Iceland'; 'Coniston Tales'; 'Early Sculptured Monuments of the Diocese of Carlisle'; 'The Lake Counties'; 'The Life and Death of Cormac the Skald'; 'King William the Wanderer,' etc.

Col'ingwood, Canada, port of entry and county-seat of Simcoe County, Ontario; on Georgian Bay, Lake Huron, and the Grand Trunk Ry., 95 miles northwest of Toronto. It is an important commercial port, the terminus of steamship lines to Owen Sound, Sault Ste. Marie, Fort William, Duluth, and other ports of the great lakes, and has a large trade in lumber, grain, produce, iron ore, etc. It is the seat of a United States consulate. It has tanneries, breweries, flour mills, sash, door, blind and pump factories; schools, churches, hotels, banks and weekly newspapers; and is lighted by gas and electricity. Pop. (1901) 5,755.

Col'lins, Anthony, English theologian: b. Heston, Middlesex, 21 June 1676; d. London 13 Dec. 1729. He was educated at Eton and at Cambridge, and devoted himself to general literature. During the years 1703-4 a correspondence was carried on between him and Locke, who regarded him as having "as much of the love of truth for truth's sake as he had ever met with in anybody." Among his numerous writings, all published anonymously, the one most commonly associated with his name is entitled a 'Discourse on Freethinking.' It attracted considerable notice at the time, and was answered, among others, by Bentley, under the assumed name of *Phileleutherus Lipsiensis*. Another work, entitled 'Philosophical Inquiry Concerning Liberty and Necessity,' was answered by Samuel Clarke. He also wrote 'Essay Concerning the Use of Human Reason' (1707); 'Priestcraft in Perfection' (1709); 'Historical and Critical Essays on the Thirty-Nine Articles' (1724); 'Deience of the Divine Attributes' (1710); 'Grounds and Reasons of the Christian Religion' (1724); 'Literal Scheme of Prophecy'; 'A Letter to the Rev. Dr. Rogers on Occasion of His Eight Sermons on the Necessity of Revelation and the Truth of Christianity' (1727). His benevolent and tolerant spirit gained the respect of many who widely differed from him on theological questions.

Collins, Edward K., American ship-owner: b. Truro, Mass., 5 Aug. 1802; d. New York 22 Jan. 1878. He early entered the shipping business, and after serving as superintendent of a packet line, established in 1836 the Dramatic Packet Line, from New York to Liverpool. In 1849 the Collins line between the same ports was inaugurated. The Arctic and the Pacific

of this line are memorable in the history of marine disasters. The government having withdrawn mail subsidies, the line ceased operations in 1858.

Collins, John, English poet and actor: b. Bath 1742; d. Birmingham 2 May 1808. He was a stay-maker, turned actor; and his poetic fame rests upon 'Scrapscrapologia,' a collection of poems, among which 'To-morrow' is especially readable.

Collins, John Churton, English author, editor, and educator: b. Bourton-on-the-Water, Gloucestershire, 26 March 1848. He was educated at King Edward's School, Birmingham, and Balliol College, Oxford, whence he was graduated in 1872. Since that time he has been engaged in journalism, education, and in public lecturing, especially pleading, both in his writings and lectures, for the study of literature as distinct from philology. Since 1904 he has been professor of English literature at the University of Birmingham. Among his publications are 'Sir Joshua Reynolds as a Portrait Painter' (1874); 'Bolingbroke' and 'Voltaire in England' (1886); 'Study of English Literature' (1891); 'Illustrations of Tennyson' (1891); 'Dean Swift, a Biographical and Critical Study' (1893); 'Essays and Studies' (1895); 'Ephemera Critica' (1901); 'Studies in Shakespeare' (1903); 'Essays in Poetry and Criticism' (1905); etc. He has also edited 'Plays and Poems of Cyril Tourneur' (1878); 'Poems of Lord Herbert of Cherburg' (1881); 'Plays and Poems of Robert Greene' (1899); Dryden's 'Satires'; Pope's 'Essay on Criticism'; Tennyson's 'Poems' (1901); Tennyson's 'In Memoriam, Maud and Princess' (1902); More's 'Utopia' (1904); Matthew Arnold's 'Merope'; 'A Treasury of Minor British Poetry'; etc., and is also general editor of the series 'Shakespeare for Schools' and 'British Classics for Schools.'

Collins, Joseph William, American ichthyologist: b. Isleboro, Maine, 8 Aug. 1839; d. 1904. His boyhood was spent on fishing schooners and he was entirely self-taught. He made the statistical inquiry into New England fisheries for the 10th United States census 1879-80, and for the United States Fish Commission, with which he remained connected until 1892. He was an official of the International Fisheries Expositions at Berlin 1880; London 1883; chief of the Fish and Fisheries department at the Chicago World's Fair 1893; and organized the section of Naval Architecture in the United States National Museum. He was a contributor to the 'Century Dictionary'; edited the 'Fishing Gazette' 1893-4; and wrote many papers and reports on his specialty.

Collins, Mabel. See COOK, MABEL COLLINS.

Collins, Mortimer, English man of letters: b. Plymouth, England, 29 June 1827; d. Knowl Hill, 28 July 1876. His father, who was a solicitor, published a volume of verse and seems to have been a good mathematician. His mother was connected with the Mortimers of Dorset. While at school, the boy wrote verse and prose for local newspapers; and began to contribute to *Fraser's* and *Punch*. At the age of 22 he married, and settled at Guernsey as mathematical master of Queen Elizabeth's Col-

COLLINS

lege. This position, which interfered with his literary work, he resigned in 1856, the year after the appearance of his first volume of poems, 'Idyls and Rhymes.' During the next 10 years, he edited several provincial newspapers and contributed extensively to the London press. A strong Tory in politics, he was accounted one of the best at political squibs. His lyrics and epigrams in the *Owl* were especially well received. In 1860 appeared 'Summer Songs' and in 1865 his first novel, 'Who is the Heir?' By 1862, he was settled at Knowl Hill, Berkshire, some 30 miles from London, where he passed the rest of his life in unremitting industry. He wrote novels, reviews, sketches of travel, and an enormous amount of verse. 'The Marquis and the Merchant' (1871) was regarded as his best novel. 'The Secret of Long Life' (1871), a collection of essays, including a notable one on laziness, ran through several editions. Collins was a "well-made man, over six feet in height, with a handsome face and well-shaped head." Among his numerous friends were Edmund Yates and R. D. Blackmore. His first wife died in 1867. The next year he married Frances Cotton, who collaborated with him in fiction and published on her own account a novel called a 'Broken Lily' (1882).

Bibliography.—Consult: 'Mortimer Collins; His Letters and Friendships' (2 vols. London 1877), a scrappy but interesting biography by his widow. To 'Pen Sketches by a Vanished Hand from the Papers of the Late Mortimer Collins' (London 1879) Tom Taylor prefixed a memoir. For some of his best pieces, consult also 'Thoughts in my Garden' (London 1885), collected and edited by E. Yates, and 'Attic Salt' (1880), a selection of Collins's epigrams, by F. Kerlake.

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Collins, Patrick Andrew, American politician: b. Fermoy, Ireland, 12 March 1844; d. Hot Springs, Va., 14 Sept. 1905. He came to the United States when four years old, went to the public schools until he was 16, became an upholsterer, saved money, and graduated at Harvard Law School in 1871. He served in the Massachusetts Legislature from 1869 to 1871, and was a delegate to the Democratic national conventions of 1876, 1880, 1884, 1888, and 1892. From 1882 to 1888 he sat in Congress and from 1893 to 1897 was consul-general at London. He was prominent in the Fenian movement, the Land League, and other Irish organizations. He was mayor of Boston 1902-5.

Collins, William, English poet: b. Chichester, England, 25 Dec. 1721; d. there 12 June 1759. He was educated at Winchester school and at Oxford, and while at college wrote his 'Oriental Eclogues,' printed in 1742. Their success was moderate, and in 1744 the author went to London as a literary adventurer. In 1746 he gave his 'Odes, Descriptive and Allegorical,' to the public; but the sale did not pay for the printing, and the poet burned all the unsold copies. These he was enabled to buy back from the publisher Millar through the generosity of an uncle who bequeathed him a small legacy. They were never widely read and their

musical verse, lyric fervor, and exquisite imagery remained unappreciated by the public for many years. Yet among these odes were many pieces which at present rank with the finest lyrics in the language. His head was always full of schemes though few of them matured with any degree of success to him and finding it more difficult to win fame than he had anticipated, he soon became dissipated and extravagant, exhausting his slender means. Yet during these times he planned works entirely beyond his power of execution and even advertised one, 'Proposals for a History of the Revival of Learning,' but did not write it. He subsequently began several tragedies but his indolence and irresolution retarded his progress and the tragedies rarely advanced beyond the preliminary stage of devising the plot. Constantly in debt and in fear of the bailiff, he finally persuaded a bookseller to advance money to leave London, in return for which he was to translate Aristotle's 'Poetics' and write a commentary, but he probably did not fulfill his agreement. Collins was always weak in body and when still a young man was affected by a mental disease. Originally too laxly strung, his nervous system was disorganized by disappointment, distress, and irregularity. Months of despondency were followed by periods of madness until he was finally taken to Chichester and cared for by a sister. His best known poems are 'The Ode on the Passions,' those to Mercy and Evening, 'The Dirge in Cymbeline,' and the famous 'How Sleep the Brave.' His odes are now almost universally regarded as among the best productions of the kind in English for vigor of conception, boldness and variety of personification, and genuine warmth of feeling. Of his 'Ode to the Evening' Hazlitt has said that "the sounds steal slowly over the ear like the gradual coming on of evening itself." Swinburne said, in speaking of the 'Ode to the Passions,' "its grace and vigor, its vivid and pliant dexterity of touch, are worthy of their long inheritance of praise." His 'Works' have been edited by J. Langhorne (1765), Mrs. Barbauld (1797), A. Dyce (1827), etc., and his 'Poems' by Bronson (Boston 1898).

Collins, William, English painter of landscapes and domestic scenes: b. London 18 Sept. 1787; d. there 17 Feb. 1847. His picture of the 'Young Fifer,' exhibited in 1811, was purchased for 80 guineas, and in 1813 he at once raised himself to a position of eminence by his 'Sale of the Pet Lamb,' so well known by engravings. In 1820 he was elected a Royal Academician. For his picture of the 'Fisherman's Departure,' painted in 1826, he received 350 guineas. Other noted works of his are 'Rustic Hospitality,' 'Sunday Morning,' and 'Happy as a King.' Two sacred pictures, 'Our Saviour with the Doctors in the Temple,' and 'The Two Disciples at Emmaus,' were exhibited in 1840 and 1841.

Collins, Sir William Job, English surgeon: b. London 9 May 1859. His medical training was obtained at Saint Bartholomew's Hospital, London, and he has since held various professional positions of importance. He was elected to the London County Council for West Saint Pancras in 1892, 1895, 1898, 1901, and 1904, and also contested that electorate for Parliament 1895 and the University of London in 1900. He

COLLINS—COLLISION

has published 'Specificity and Evolution in Disease' (1884-90); 'Pathology of Cataract' (1897); 'Spinoza' (1889); 'Rationalism in Medicine' (1890); 'The Man v. the Microbe' (1903); 'Physic and Metaphysic' (1905); etc. He was raised to knighthood in 1902.

Collins, William Wilkie, English novelist: b. London 8 Jan. 1824; d. there 23 Sept. 1889. The eldest son of William Collins, the landscape and portrait painter, he also bore the name of David Wilkie, the distinguished academician. Among his friends and in letters he was always known as Wilkie Collins. Educated privately, he passed two years (1836-38) with his father in Italy, where he became greatly interested in Italian art, scenery, and history. In 1841 he obtained a clerkship in a London firm of tea-merchants with a view to a business career. After five years of this, he began the study of law, and was called to the bar in 1851. While thus hesitating between law and business, he had shown for some time a bent towards art and literature. For landscape especially, he possessed talent. His first book to be printed was a memoir (1848) of his father who died in 1847; but he had written, long before this, 'Antonina, or the Fall of Rome,' an historical romance of the Bulwer-Lytton type. It was given to the public in 1850. The next year he published an account of a summer in southwest England under the title, 'Rambles beyond Railways.' Both books were well received. He now met Dickens, and at once became a man of letters. Thereafter the two novelists lived in the most delightful friendship. They frequently collaborated on novels, and Collins contributed largely to Dickens's 'Household Words' and 'All the Year Round.' The new influence upon Collins—Dickens in place of Bulwer-Lytton—was at once manifest in 'Basil' (1852), which dealt realistically with contemporary life in London. From history his descent was quick to a clerk and a linendraper's daughter. Then followed 'Hide and Seek' (1854), 'The Dead Secret' (1857) and numerous short stories like the clever series of ghost tales called 'After Dark' (1856).

In this early work Collins sometimes displayed great skill in concentrating attention upon a dominant *motif* which engrossed the reader as well as himself. In his view, the novel was a twin sister of the drama. But he first discovered his extraordinary talent in 'The Woman in White' (1860), which nobody left unread. It was absolutely a new type, depending in no wise upon the interest in character nor in adventure or incident as such, but upon the adroit manipulation of incident for first concealing and then revealing a secret. Collins is the father of the detective story. His first great success was repeated in 'The Moonstone' (1868). In other novels of the period he usually moulded his plot to a distinct didactic purpose. This is particularly true of 'No Name' (1862), 'Armadale' (1866), 'Man and Wife' (1870), and 'The New Magdalen' (1873), all of which are among the most interesting novels of their kind. In 1873-4, Collins visited the United States, where he gave readings from 'The Frozen Deep' and other stories which he had just written. Several of

his novels, dramatized either by himself or by others, were popular on the stage both in England and in the United States. He was buried at Kensal Green.

Bibliography.—Notable appreciations of Collins have been written by Swinburne, 'Studies in Prose and Poetry' (London 1894); Quilter, *Contemporary Review* for April, 1888; and Lang, *Contemporary Review* for January, 1890.

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Col'linson, Peter, English botanist: b. Hugall Hall, Westmoreland, 1693; d. 1768. A merchant in London, he yet found time for studies in natural history, which gained him the acquaintance of the most eminent naturalists of the time. He gave especial attention to botany, and to the naturalization of plants and trees in regions remote from their original habitats. He sent over to Maryland, Pennsylvania, and other Atlantic States, many foreign ornamental shrubs, which found in America a congenial soil and climate; and he introduced into England many American forest trees. He was one of the first to suggest the culture of the grape in Virginia. A genus of labiate plants is named *Collinsonia* from him.

Colli'sion, in navigation, the shock of two ships coming into violent contact, whereby one or both may suffer more or less injury. The American rules in regard to the prevention of such accidents are based upon the same principles as the British, with which they are substantially identical. The leading doctrines of the English law on this subject are thus stated by Lord Stowell: "In the first place, collision may happen without blame being imputable to either party, as where the loss is occasioned by a storm or any other *vis major*, in which case the misfortune must be borne by the party on whom it happens to light. Secondly, a misfortune of this kind may arise where both parties are to blame—where there has been a want of due diligence or skill on both sides; in such case the loss must be apportioned between them, as having been occasioned by the fault of both of them. Thirdly, it may happen by the misconduct of the suffering party only, and then the rule is that the sufferer must bear his own burden. Lastly, it may have been the fault of the ship which ran the other down, and in that case the injured party would be entitled to an entire compensation from the other. In a court of common law the same rule holds in the first, third, and fourth cases; but in the second (where both parties are to blame) the rule is, that if the negligence of both substantially contributed to the mishap, neither has an action against the other; but if one of them, by exercising ordinary care, might have avoided the consequence of the other's negligence, the former is liable for any injury sustained by the latter." In pursuance of the Merchant Shipping Amendment Act (1862), orders were issued in 1863, 1879, 1884, and 1885, giving regulations for preventing collisions. These contain rules concerning lights and fog-signals, and sailing and steering rules. With respect to lights it is enacted that steamers shall, when under way, carry a white mast-head light, on the star-board side a green, and on the port a red light; when towing other vessels they must

COLLODION — COLLOT

carry two mast-head lights, placed vertically. Sailing vessels shall carry only the side lights; fishing and other open boats are not required to carry side lights, but may use a lantern with a red slide on the one side and a green slide on the other, and such lantern must be exhibited in sufficient time to prevent collision, and so that the green light shall not be seen on the port side nor the red light on the starboard side. Ships at anchor in a roadstead must exhibit a white light where it can best be seen, but not 20 feet above the hull, in a globular lantern eight inches in diameter, showing at a distance of a mile all round. The sailing and steering rules demand that if two sailing ships are approaching each other end on, or nearly so, the helms of both must be put to port, so that each may pass on the port side of the other; in crossing so as to involve risk of collision the sailing ship with the wind on the port side shall keep out of the way of the ship with the wind on the starboard, but if they have both the wind on the same side the ship which is to windward shall keep out of the way of the one that has it to leeward. If a steamship and a sailing ship are approaching so as to involve collision, the former must keep out of the way of the latter. The rules for two steamships passing or crossing are nearly the same as for sailing ships. If one vessel is overtaking another she must keep out of the way of the last-named vessel. When, according to the rules, one of the ships keeps out of the other's way, that other shall generally be understood to keep her course. See NAVIGATION LAWS; RULES OF THE ROAD.

Collo'dion (Gr. *κολλώδης*, "like glue"), a solution, in mixed alcohol and ether, of soluble pyroxyline (or "gun-cotton"). It is colorless, and very inflammable. The gun-cotton that is used in its manufacture is commonly prepared by the action of a mixture of nitric and sulphuric acids upon cotton-wool that has been boiled in a solution of sodium carbonate (to remove all greasy and resinous matters), and afterward thoroughly washed and dried. The following details are recommended for the subsequent operations: Three fluid ounces of strong nitric acid are diluted with two fluid ounces of water, and nine fluid ounces of strong sulphuric acid are added. When the mixture has cooled to about 140° F., 100 grains of the cotton-wool are added in tufts weighing about 10 grains each. At the end of 8 or 10 minutes the acid is poured off, and the cotton is subjected to gentle pressure to expel the greater part of the fluid that its fibres have retained. The cotton is next thoroughly washed with water (or weak solution of sodium carbonate) until the acid has been entirely eliminated, after which it is allowed to dry. The product is "soluble gun-cotton." It does not differ materially, in appearance, from the original cotton; but if the operations to which it has been subjected have been correctly carried out, it will be found that the cotton has become soluble in a mixture of equal parts of alcohol and ether. Commercial collodion contains about 60 grains of gun-cotton to each 10 ounces of the solvent. Before the advent of the dry-plate process, collodion was greatly used in photography for the preparation of sensitive plates; and at the present day it is used to some extent in this way, especially in certain branches of photo-engraving. In the preparation of these plates the col-

lodion is first iodized or brominized by the addition of the iodides and bromides of cadmium and ammonium, and is then poured over a carefully cleansed glass plate. The volatile solvent evaporates rapidly, leaving a film of iodized gun-cotton upon the glass. Immediately before the exposure is made, the coated plate is immersed in a solution of nitrate of silver, with the result that a deposit of iodide and bromide of silver, sensitive to light, is formed in the gun-cotton layer. The plate is next exposed in the camera, and afterward developed in the usual way. Collodion is used in the place of adhesive plaster, in the case of trivial injuries, to afford protection from the air, and from pyogenic and other objectionable germs. When applied to the injured spot it quickly dries, leaving a tough, elastic coating which is impervious to moisture. It was first employed in surgery by Dr. J. Parker Maynard, of Boston, Mass., in 1847. It is also medicated in various ways, one of the best-known varieties of this sort being blistering collodion, which contains cantharides, and is applied to the skin for the purpose of producing a blister. Medicated collodion is also largely used in chiropody.

Col'loids (Gr. *κολλώδης*, "glue-like"), substances, such as albumin and silicic acid, which, when combined with water in certain proportions, exhibit a gelatinous consistency. The word does not imply that there is any chemical resemblance among the bodies to which it is applied, the distinction between colloids and non-colloids being wholly physical. The term "colloid" was proposed by Thomas Graham, in 1861, to designate substances that are practically incapable of diffusion through porous membranes. Substances such as salt, sugar, and the mineral acids, which diffuse readily through such membranes, were called by him "crystalloids." The distinction is a convenient one, and has been universally adopted by chemists and physicists. It is probable that colloidal substances do not combine with water to produce true solutions. Quincke, for example, says:

I believe gelatinous substances, such as glue and other jellies, should be regarded as fluids in which there are numerous invisible thin partitions of firm or fluid lamellæ,—the structure of a colloidal substance being likened by him, in other words, to that of a sponge filled with water.

Similar views have also been held by other competent authorities. For a discussion of the phenomena exhibited by colloids and crystalloids in solution (or apparent solution) see DIFFUSION.

Colloph'anite (Gr. *κόλλα*, "glue" + *φαίνειν*, "to appear" = "glue-like"), a native amorphous phosphate of calcium, having the formula $\text{Ca}_3\text{P}_2\text{O}_7 + \text{H}_2\text{O}$, and found principally on the island of Sombbrero, the phosphoric acid that it contains being derived from the guano deposits there. Collophanite is white or nearly so, with a specific gravity of 2.7 and a hardness of from 2 to 2.5. The name is given on account of the glue-like appearance of the mineral.

Collop Monday, the Monday after Quinquagesima Sunday and preceding Shrove Tuesday. It was so named because on that day the faithful ceased eating flesh, meat, or collops.

Collot, d'Herbois, Jean Marie, zhōn mā rē kō-lō dār-bwä, French revolutionary leader:

COLLOTYPE PROCESS

b. Paris 1750; d. Cayenne, South America, 8 Jan. 1796. He was an actor, who adopted the name of D'Herbois. On the breaking out of the French Revolution he zealously espoused the views of the ultra-party, and published his 'Almanach du Père Gérard,' which gave him much influence with the most violent revolutionists. After the events of 10 August he became a member of the Municipal Council of Paris, and a few days after the horrors of September was chosen deputy to the national assembly. He afterward became an active leader of the Mountain against the Girondists. He was sent by Robespierre along with Fouché to Lyons, in 1793, with almost unlimited powers, and was guilty of the most flagrant enormities. Declaring that he found the guillotine too tedious and formal, he introduced the method of executing wholesale by the sword and by discharges of musketry. On his return from Paris he became a determined opponent of Robespierre, and being chosen president of the convention (19 July 1794), contributed powerfully to his fall. A few weeks after his own downfall followed. On the motion of Merlin he was expelled from the assembly and banished to Cayenne.

Col'lotype Process, a method of reproducing engravings, photographs, etc., allied to photolithography (q.v.). It is worked universally, and is known by a variety of names: the Germans call it "Lichtdruck," the French "Phototypie," the Americans "Phototype," and the English have given it the titles of "Photoprint," "Heliochrome," "Autotype," "Photophane," "Photo-mezzo-type," "Graphotone," etc.

The process is based on the well-known action of light on bichromatized gelatine. It differs from photo-lithography in that in collotype the exposed image in gelatine is employed for the actual printing surface, and not only can line subjects be printed from it, but copies of photographs, paintings, and drawings. It renders half-tones so accurately that when prints by collotype process are made on highly glazed paper with a suitable ink there is scarcely any perceptible difference between them and ordinary silver prints; platinotype and bromide prints can also be closely imitated. The process is largely used for the production of view books, fac-simile copies of engravings, copies of paintings, portrait work, and for commercial illustrations. When a film of bichromate mixed with gelatine is exposed to light under a negative, then washed and dried, it will when treated like a lithographic stone absorb water where the gelatine film was protected from light by the dense portions of the negative, and will take ink and form a printing surface in the places where light has obtained access to the film through the negative. A collotype plate will not only take ink where absolutely clear glass occurs in the negative, but it will take ink in the half-tone in exact gradations corresponding to the amount of light passing through the negative. This property is most valuable, and, as a matter of fact, constitutes the process.

The preparation of collotype plates is not difficult. The printing plate is formed of a piece of plate glass of about half an inch in thickness, ground on the printing side to give a better hold to the gelatine. In order that the film may

withstand the heavy pressure of the printing press, it is found necessary to coat the plates first with a substance containing albumen, water-glass, and water. This solution is spread over the cleaned glass in a thin coating and dried. The sensitizing solution for collotype printing is composed of Coignet's gelatine, 3 ounces; albumen, 1 ounce; water, 25 ounces; and bichromate of potash, $\frac{1}{2}$ ounce. The exact proportions are not arbitrary, and different operators modify their solution as experience guides. The sensitizing solution is carefully filtered through flannel, and, while warm, is poured over the surface of the "substratumed" glass plate in a fairly thick film; the coated plate is then placed on accurately leveled supports in a drying-chamber or box, and heat is applied to the bottom of the box, which is made of sheet iron. Considerable heat is required to dry the plates, and the grain or texture of the plate is affected by the speed of the drying; about four hours is the usual time occupied. When the plate is dry and cool it is ready for exposure under the negative; the qualities necessary in a collotype negative are that it must be reversed, and be of full printing strength. A negative that would render a full rich print by any silver printing process is the proper standard for collotype. The margins of the negative are masked with thin opaque paper or tinfoil, so as to permit of the picture being printed with a clean edge on paper with proper margins. The time required for the exposure under ordinary conditions as regards light is from 20 minutes to half an hour, but this is a matter which can only be fixed by experience. The image on the plate cannot be examined during exposure, and an actinometer scale is used for gauging the amount of light. After exposure the plate is taken into a room lighted a dull or yellow light, and washed in running water for about half an hour in order that all the soluble unacted-upon bichromate may be removed from the film, after which the plate is allowed to dry spontaneously, when it is ready for printing.

The printing may be performed in an ordinary press used for letterpress printing, or in a lithographic press. For rapid printing, or for long runs, special steam-driven presses are constructed, with cylinder pressure, on which it is possible to print two or three hundred copies per hour.

When the plate is fixed in position in the press, it is first wetted all over with a sponge and water, or with a solution of common salt, glycerine, and water, which, after being allowed to act on the gelatine for 10 or 15 minutes, is sponged off, and the plate is rolled up with ink. If the printing is being done on a hand press, a coating of ink is applied first with a leather roller, which inks up the shadows and stronger parts of the picture. This inking is then followed by another with a gelatine roller, which inks up the half-tones and details of the subject. A sheet of ordinary printing paper is now placed over the inked surface, and pressure applied. The result is a permanent ink print on paper of the negative used. If the printing is done on a steam press, the operations are, of course, more mechanical, but the finished result is practically the same. Large plates can be successfully dealt with, and pictures on paper up to 40 by 30 inches can be printed.

COLLUSION — COLOCYNTH

The collotype process has had a long and successful career, and the beauty and delicacy of its results, when properly printed, are fully equal to that of any other photo-mechanical process, but of late years the advances made in half-tone blocks, and more especially in the machinery constructed for printing them, has to some extent covered the ground hitherto occupied by collotype illustrations alone; and though the half-tone block can never oust or replace collotype for many kinds of illustration, yet it is sufficiently a rival to restrict its expansion and scope from a commercial point of view.

Collusion, kōl-lū'zhōn (Lat. *collusio*, "a playing together"), a secret agreement between opposing litigants to obtain a particular judicial decision on a preconcerted statement of facts, whether true or false, to the injury of a third party. Collusion, when proved to exist, nullifies the judgment obtained through it.

Collyer, kōl'yēr, **Robert**, American clergyman: b. Keighley, Yorkshire, Eng., 8 Dec. 1823. He came to the United States in 1849, being then a Wesleyan preacher and a blacksmith, but became a Unitarian, and preached some years in Chicago, where he founded Unity Church in 1860 and was its pastor 1860-79. He was made pastor of the Church of the Messiah, New York, in September 1879, and pastor emeritus in 1896. Included in his publications are: 'Nature and Life' (1864); 'The Life That Now Is' (1871); 'The Simple Truth' (1878); 'A History of the Town and Parish of Ikley' (England, 1886, written with Horsefall Turner); 'Talks to Young Men' (1888); 'Things New and Old' (1893); 'A Man in Earnest.'

Collyridians, kōl-ī-rīd'ī-anz (Gr. *kollyridia*, "little cakes"), a sect toward the close of the fourth century, so denominated from the little cakes which they offered to the Virgin Mary. The sect consisted chiefly of Arabian women, who, out of an extravagant devotion to the Virgin, met on a certain day of the year to celebrate a solemn feast, and to render divine honors to her as to a goddess, eating the cakes which they offered in her name. It is said that the members of this sect were not native Arabs, but immigrants from Thrace and Scythia. While pagans they had been accustomed to offer similar cakes to Venus or Astarte.

Colman, kōl'man, **Benjamin**, American clergyman: b. Boston, Mass., 19 Oct. 1673; d. there 29 Aug. 1747. He graduated at Harvard in 1692, began preaching, sailed for England 1695, was captured by a French privateer, and after a short imprisonment, reached England. He received ordination in London, and returned to take charge of the Brattle Street Church, Boston, remaining with that society until his death. He was for many years one of the leading clergymen of New England, exerting a strong influence on civil affairs that frequently drew censure upon him. He procured considerable benefactions for Harvard and Yale, and was offered, but declined, the presidency of the former, in 1724. His collected sermons were printed at Boston 1707-22, and his 'Life' was written by his son-in-law, Rev. E. Turell (1749).

Colman, **George** ("THE ELDER"), English dramatist: b. Florence 28 April 1733; d. London 14 Aug. 1794. He wrote in 1760-1 the

comedies of 'Polly Honeycombe' and the 'Jealous Wife.' 'The Clandestine Marriage' we owe to him and Garrick. This was left unfinished, and it has never been ascertained to which of the authors most credit is due for one of the best pieces in our theatrical repertory. 'The English Merchant,' the 'Oxonian in Town,' and other pieces, followed the foregoing. In 1777 he purchased the little theatre in the Haymarket, and continued in the personal superintendence of it till the year 1790.

Colman, **George** ("THE YOUNGER"), English dramatist, son of the preceding: b. London 21 Oct. 1762; d. there 26 Oct. 1836. He was entered as a student in the Temple, but soon left legal studies for dramatic and general literature. He assisted his father as director of the Haymarket Theatre, and succeeded him as its patentee. After selling his interest in the theatre he was appointed examiner of plays, the duties of which he performed with a severe purism, hardly to have been expected in a man who wrote with almost licentious freedom himself. Most of his dramas were well received, and some of them still keep the stage; as 'John Bull'; the 'Heir-at-law'; 'Poor Gentleman'; and 'Love Laughs at Locksmiths.'

Colman, **Norman J.**, American office holder: b. Richfield Springs, N. Y., 16 May 1827. He settled in St. Louis, Mo., and adopted the legal profession. In 1874 he was elected lieutenant-governor, and was commissioner of agriculture in President Cleveland's first administration 1885-9. Shortly before his term of office ended, Congress enacted the law raising the Department of Agriculture to the rank of an executive department, with its chief a Cabinet officer, 11 Feb. 1889.

Colman, **Samuel**, American landscape painter: b. Portland, Maine, 4 March 1832. He studied in Europe 1860-2; was elected a member of the National Academy in 1862; and first president (1866-71) of the American Society of Painters in Water Colors. He has traveled extensively, and his pictures include scenes from Algeria, Germany, France, Italy, and Holland.

Colmar. See KOLMAR.

Colne, kōln, England, a municipal borough in the county of Lancaster, and 31 miles south-east of the town of Lancaster. The most remarkable edifice is the Piece Hall, in the Elizabethan style. The chief manufactures are cotton goods. Colne was one of the earliest seats of the woolen and cotton manufacture in England, but woolens are no longer made there. Pop. (1901) 23,000.

Colocasia. See COCCO.

Colocollo, kō-lō-kōl'lō, a wild cat (*Felis colocollo*) found in Guiana and Chile. It is somewhat larger than the domestic cat, is whitish-gray in color, with elongated black markings on the back and sides.

Colocynth, kōl'ō-sīnth, the fruit of *Citrullus Colocynthus*, deprived of its rind. The plant, one of the *Cucurbitaceæ*, or melon family, is widely distributed over waste lands in Arabia and adjacent countries, the Mediterranean islands, Cape of Good Hope, Java, southern Spain, and Europe. It is also extensively cultivated. It is collected when the fruit is nearly ripe and peeled while fresh. The fruit subse-

COLOGNE — COLOGNE YELLOW

quently contracts somewhat, is whitish in lustre, and very porous and light. As found in the market colocynth occurs as light, yellowish white balls, from one to three inches in diameter, that are very porous and fragile. It contains a large number of whitish seeds in six compartments. On breaking, the fruit splits irregularly, although there may be a tendency to dehisce in threes. The active principles are a resin and a bitter glycoside, colocynthin ($C_{56}H_{42}O_{23}$ Walz). Colocynth is an active drastic purgative and is rarely administered alone because of its harsh action, but in small doses in combination with other drugs, it is widely used as a laxative and purge. The compound cathartic pill and the vegetable pill are the chief vehicles that contain colocynth. The compound extract, made of colocynth, aloes, scammony, soap, and cardamom, is widely employed in other preparations. Colocynthin is recommended as a rectal cathartic in doses of $\frac{1}{8}$ to $\frac{1}{2}$ grain. Colocynth itself can be given in doses up to five grains.

Cologne, kō-lōn' (German, *Köln*), Germany, a strongly fortified city of Prussia, in the Rhine province, on the left bank of the Rhine. It stands upon the river in the form of a crescent, and is connected with Deutz, on the opposite side and forming part of it, by a bridge of boats and an iron bridge. Till recently it was surrounded by fortifications dating from the Middle Ages, but these have been cleared away, their site built upon, and a wider circuit of works constructed. Until the middle of the 19th century a great part of the city bore the impress of the Middle Ages, the streets being dark, narrow, and filthy; but now the municipality has paid great attention to the appearance and sanitary condition of the town generally by opening up thoroughfares, widening and paving the streets, etc. Among the principal buildings are the townhouse, a remarkably fine Gothic building, partly of the 14th century; the Gürzenich (1441-52), a splendid Gothic building, used for public festivities, and also accommodating the exchange; the Tempelhaus, a fine Romanesque building of the 12th or 13th century, occupied as the Chamber of Commerce; the government buildings, courthouse, postoffice, Imperial Bank, and railway station. But the object of greatest interest in the town is the cathedral, begun in 1248, one of the finest and purest Gothic monuments in Europe. It is in the form of a cross; its entire length is 490 feet; its breadth, 231 feet; the roof rests on 100 columns, of which the four centre ones are 30 feet in circumference. The choir was long the only part finished; it is 161 feet high, and, with its pillars, arches, chapels, and its superb painted glass windows, presents one of the finest sights conceivable. In 1842 the completion of this magnificent edifice was begun, after designs by Zwirner; the works were vigorously prosecuted from that time onward, and were completed in 1880. The two western towers are each 511 feet high, and are among the highest edifices in the world. The other remarkable churches are those of St. Peter, in which is an altar-piece of the crucifixion of that saint, by Rubens, who presented it to this church, in which he was baptized; St. Mary, on the capitol, occupying the site of the capitol of the ancient Roman city, and dating from about the year 1,000, with some good stained glass windows; the Apostles' church, in the

Neumarkt, built about the year 1200, a perfect specimen of the Romanesque style, having a singularly elegant and picturesque exterior; the church of St. Ursula, filled with the bones of the 11,000 British virgins, who, according to the legend, were destroyed here on their return to Britain, under the guidance of St. Ursula; the church of the Jesuits, or Maria Himmelfahrt, dating from 1636, overloaded with gorgeous decorations of marble sculpture, etc.; and St. Gereon's, which, like the church of St. Ursula, is lined with bones, not, however, of virgins, but of the Theban legion of martyrs, slain, according to tradition, during the reign of Diocletian; this is one of the finest and oldest churches in the city. The city contains several gymnasia and other high-class institutions; a technical school; an observatory, and botanical garden; a normal school, a public library, a theatre, several hospitals, a school of design, a museum, etc. The manufactures are very extensive and varied, embracing sugar, chocolate, tobacco and cigars, glue, liqueurs, mineral waters, starch, vinegar, soap, candles, velvet, silk, woolen and cotton goods, India-rubber, and gutta-percha wares, machinery and metal goods, etc., and the celebrated eau de Cologne, of which there are a great many different manufacturers. Its commerce is considerable; it has a good port on the Rhine, and an extensive railway communication with the interior of Germany and with Belgium and Holland. It is the principal entrepôt of the corn, wine, and oil trade on the river, and has active commercial relations with the Netherlands, Germany, Belgium, and Switzerland.

Cologne is of ancient origin, and was originally called *Oppidum Ubiorum*, being the chief town of the Ubii, a German nation. The Romans made it a colony 51 A.D., and called it *Colonia Agrippina*. It was annexed to the German empire in 870, and became one of the most powerful and wealthy cities of the Hanseatic league, its population then amounting to 150,000. As early as the 11th century Cologne carried on an extensive trade with foreign countries, including England, in the produce of the country—wine, corn, flour, malt, beer, etc. The arts and sciences also flourished, and its university was one of the most famous in Germany. Intestine divisions, and other causes, finally effected its ruin, and in 1792 it ceased to be a free city. It was taken by the French in 1794, ceded to them by the Treaty of Luneville in 1801, and restored to Prussia in 1814. Duns Scotus died in Cologne in 1308, and was interred in the chapel of the Minorites; and Rubens was born here in 1577, in the same house in which Mary of Medicis died, in 1642. Pop. (1900) 372,229.

Cologne, Eau de. See EAU DE COLOGNE.

Cologne Earth, a kind of ochre, of a deep-brown color, transparent, and especially valuable in water-color painting because of its durability. It is an earthy variety of lignite or partially fossilized wood.

Cologne Yellow, a pigment consisting of two parts yellow chromate of lead, one of sulphate of lead, and seven of sulphate of lime or gypsum. It is prepared by precipitating a mixture of nitrate of lead and nitrate of lime with sulphate of soda and chromate of potash.

COLOMB — COLOMBIA

Colomb, kō-lōm', SIR **John Charles Ready**, English military writer. He was educated at the Royal Naval College and entered the Royal Marine Artillery in 1854, retiring in 1869 with the rank of captain. He was member of Parliament for Bow and Bromley 1886-90, and was knighted in 1888. He has published 'Protection of Commerce in War' (1867); 'Imperial Strategy' (1868); 'The Distribution of Our War Forces' (1869); 'Colonial Defense and Colonial Opinions' (1873); 'The Defense of Great and Greater Britain' (1879); 'Naval Intelligence and Protection of Commerce' (1881); 'The Use and Application of Marine Forces' (1883); 'Imperial Federation: Naval and Military' (1886); 'British Defense' (1900); 'British Dangers'; 'Our Ships, Colonies, and Commerce in War' (1902).

Colomba, kō-lōn-bä, a romance by Prosper Mérimée, published 1830. It is the story of a Corsican vendetta, followed up to the end by the heroine, with a wild ferocity tempered with a strange piety. The story has an ethical significance of a rather unfortunate kind, for the author's belief in the dogma of fatalism underlies the whole of it,—that circumstances control the human will, and whether a man is a brigand or a philanthropist depends purely on chance, crime and virtue being mere accidents.

Colombia, The Republic of, a country of South America; bounded on the north and northwest by the Caribbean Sea and the Republic of Panama; on the east by Venezuela and Brazil; on the south by Brazil, Peru, and Ecuador; on the west by the Pacific Ocean. Its area cannot be stated precisely, estimates ranging between 424,000 and 482,000 square miles; official estimate, 472,202 square miles. The boundary lines between it and three of the neighboring countries are in dispute. The republic is divided into eight departments as follows: Two on the Caribbean coast, Bolivar, and Magdalena; one with coasts upon both oceans, Cauca; and five in the interior, Tolima, Antioquia, Boyacá, Cundinamarca, and Santander. The capital and largest city of the country is Bogotá (q.v.). Others of importance are: Vélez, Bucaramanga, San José de Cúcuta, Neiva, Medellín, Manizales, Pasto, Cali, Cartagena (q.v.) Barranquilla, and La Mesa.

Physical Features.—The Andes of Colombia are divided into three ranges—the Cordillera Oriental, Cordillera Central, and Cordillera Occidental—with intervening uplands of great extent, which are habitable and fertile, but as yet rather inaccessible. Of the three ranges mentioned, the western Cordillera is the least impressive, though it extends farther toward the north than the others. The central Cordillera has the greatest number of snow-clad summits. Some of the altitudes are: Sierra Nevada, estimated 23,779 feet; Alto del Viejo, 12,965 feet; Boca del Monte, 12,735 feet. The highest snow-peak of the central Cordillera is the volcano called Huila. The volcanos of Sotará (extinct), Pasto, Chiles, Puracé, and Azufral are well known, but the ordinary demonstrations of volcanic energy are earthquakes. See CORDILLERAS. There are four river systems in the republic: (1) The western system, comprising the streams which flow from the western Cordillera into the Pacific Ocean; (2) the river Cauca and its affluents; (3) the Magdalena

River with its affluents; (4) the streams of the eastern slope of the eastern Cordillera, including the upper Orinoco and upper Amazon, and some of the tributaries of those great rivers. Important harbors on the Caribbean coast are: El Portete of Rio Hacha, Santa Marta, Sabanilla (the active port of Barranquilla), Cartagena, etc. On the Pacific coast line are the Bay of Malaga, with the harbors of Guapi and Izcundé; the bays of Pasacaballos and Buenaventura; the harbors of Tumaco and Trinidad, and the gulfs of Montijo, David, and Dulce.

Climate.—The coast and some interior valleys are intensely hot and insalubrious. On the elevated plateaus the temperature is that of perpetual spring. The lowest average temperature in any inhabited part of the mountainous country is 20° F. The peaks of the Cordilleras are covered with snow always. In spite of the equatorial situation of Colombia, the Andes make temperature merely a question of altitude. At Bogotá the thermometer ranges from 55° to 70 F. Alternating periods of dry weather and rainy weather, each generally of three months' duration, are Colombia's "summer" and "winter."

Resources, Flora and Fauna.—Gold is found in Antioquia; in the Chocó region, department of Cauca; in Santander and Tolima, etc. Silver mines are especially productive in Antioquia, Cauca, and Tolima. Aggregate annual output of these metals, about \$4,100,000. Iron is found in Cundinamarca and Antioquia; copper in Boyacá and Magdalena; platinum, sulphur, salt, emeralds, lime, nitre, chalk, marble, petroleum, asphaltum, alum, magnesia, amethysts, lead, tin, manganese, mercury, and cinabar in various parts of the country. Emeralds valued at \$100,000 were produced annually at the Muzo and Coscuez mines up to 1899. The low and torrid regions (coasts and valleys) produce coffee, sugarcane, bananas, cacao, yucca, cotton, tobacco, indigo, vanilla, rice, and many kinds of tropical fruits. The temperate middle region of the Andes is suited to the cultivation of wheat, barley, etc., but these grains are not produced in very large quantities, owing to the lack of means of transportation. Vast tracts of forest remain to be explored. It is assumed that rare botanical treasures will be found in their recesses; and with good reason, since the known varieties of Colombian flora are of exceptional interest. Building, cabinet, and dye-woods are plentiful; the rubber-tree, the cinchona, wax-palms, cedar, balsam of tolu, lignum vitæ, and mahogany flourish especially. In the southeast are great plains suitable for grazing, but as yet unappropriated. The total number of cattle in the republic is only about 3,500,000, with an equal number of sheep, goats, and swine. There are some excellent horses and mules of Andalusian stock. Wild animals of the intertropical or higher regions are: the puma, bear (two species), jagua, alligator, sloth, armadillo, tapir, deer, cavy, opossum, guagua, and 17 distinct species of monkeys. Serpents (the boa constrictor, yaruma, etc.), are not found at a greater height than about 5,000 feet above the sea, though they are very numerous in the lowlands. Characteristic birds are: parrots (many varieties), paroquets, cockatoos, lorries, cranes, storks, the condor, and sol-y-luna.

COLOMBIA

Commerce, etc.—The average export trade of Colombia before the secession of Panamá, amounted to about \$15,000,000 annually. Imports during the five years immediately preceding the outbreak of hostilities in 1899 averaged about 14,000,000 pesos (gold). Exports to the United States during the fiscal year ending 30 June 1901 were valued at \$3,230,625, as against \$4,307,814 in 1900. Imports from the United States were valued at \$3,142,052 for 1901, as against \$2,710,688 for the preceding 12 months. The United States took about 27 per cent in value of Colombia's total exports; Great Britain 25 per cent; France 17 per cent; Germany 16 per cent. The articles exported are: coffee, quinine, emeralds, cacao, sarsaparilla, tobacco, indigo, ivory nuts, dyes, balsams, resins, straw hats, orchids, cattle, hides and skins, rubber, gold, and silver. The principal imports are: cloths of wool, cotton, linen, and silk, shoes, ready-made clothing, furniture, paper, machines, haberdashery, watches, drugs, books, flour, liquors, pottery, and iron. Duties are levied on exports as well as on imports.

Manufactures.—Sugar, molasses, articles of iron, ordinary cotton and woolen cloths, sole-leather, saddles, shoes, furniture, hats, jewels, books, pottery, varnishes, mats, bags, cigars, cigarettes, liquors, carpets of maguey thread, hammocks, hempen sacks, and household utensils are manufactured on a very small scale, partially supplying home consumption.

Transportation and Communication.—At the beginning of the year 1901, according to official information, there were in the republic 605 kilometres (376 miles) of railways; and before the events of November, 1903, eleven lines of steamships plied between the ports of Colombia and those of Europe and the United States. England had five lines, France two, Germany two, Italy one, and Spain one. There was not a single line of American steamers running to Colombian ports at that time. Inland traffic on the Magdalena River employs 42 small steamers. In some recent years the post-office has carried only about 2,600,000 letters, postal cards, newspapers, and parcels. The telegraph system has suffered especially. The total length of its lines in 1898 was given as 8,600 miles; the principal cities being connected with each other, and with the systems of Venezuela and Ecuador, as well as (by cable) with the United States. All the telegraph lines are owned by the government.

Coins.—Silver is the standard; the peso (value in United States gold or silver, \$0.361) is the unit. The gold coins are the condor (\$9.647) and double condor; silver coins, the peso and divisions. Paper money was issued during the war in such quantities that it became practically valueless.

Weights and Measures.—The kilogram (kilo), equivalent to 2.2046 pounds avoirdupois; carga = 125 kilos; quintal = 50 kilos; arroba (dry) = 12½ kilos; libra = 1.102 pounds avoirdupois. In liquid measure the French litre is the standard. Measure of length, the vara = 80 centimeters.

Federal Government.—The president is chosen (by electoral colleges) for a term of six years. His cabinet, though nominally composed of six secretaries, in recent practice has been limited to four, namely, state and interior, war, finance, and foreign affairs. As in Chile, the

secretaries are responsible to congress. A council of state (7 members) is also prescribed by the constitution for the assistance of the executive branch. When for any reason the president ceases to exercise the functions of his office, temporarily or finally, during his term, the vice-president takes his place; failing both, the vacancy is filled by a substitute elected by congress for a term of two years. In time of peace congress meets at Bogotá every two years on 20 July. It is composed of the senate (27 members; 3 from each department) and the house of representatives (one member for every 50,000 inhabitants; term, 4 years; elected directly by citizens—whereas the senators are chosen by departmental assemblies). Judicial authority is exercised by the supreme court (seven magistrates), the district courts, circuit judges, and municipal judges.

Revenue and Debt.—The revenue of the government is mainly derived from the customs, as may be exemplified, thus: Estimated government revenue for 1901–2 (in paper pesos), 28,983,640; estimated amount of customs duties in the same years, 21,450,640 paper pesos. Minor sources of revenue are the government monopolies—the salt mines near Bogotá, the slaughtering of cattle, and the sale of meat. Estimated expenditures for 1901–2 exceeded the estimated revenues for the same years by more than 11,000,000 paper pesos. In 1901 the government offered for sale or lease its emerald mines (Muzo and Coscuez). The exploitation of coal mines and other deposits of minerals in the republic was undertaken in the same year by Swiss capitalists and a mining company organized in the United States. The sale of monopolies supplies the departmental governments with a large portion of their revenues. The total external debt of the nation in 1901 amounted to more than \$14,000,000, the arrears of interest being about \$506,000. The internal debt, two months before the war began, had reached a total of 11,359,074 pesos.

Army and Navy.—In time of war the president's powers are so greatly enlarged by constitutional provision that they become those of a dictator. He has then, among other privileges, the right to claim the military service of every able-bodied male citizen, the age limits being disregarded in practice. In time of peace congress determines the strength of the army at each biennial session. The regular army in former years was usually maintained on a peace footing of 5,500, the reserve being estimated at 120,000 men. The government maintains only two or three small war vessels.

Population and Classes.—Uncivilized Indians to the number of 150,000 or more are found in the territories or districts outside of the departmental limits. Largely mixed with the whites of the lower classes are the numerous descendants of the aborigines in Cundinamarca, Cauca, and Boyacá. Negroes abound in Bolívar, and the Cauca valley, but are rare in the interior departments. The population of Antioquia (570,000) is chiefly white. Members of the ruling class, almost exclusively of European descent, preserve the language and literary traditions of Spain. The total population was about 4,000,000 when the war of 1899–1902 began.

Education.—Primary education is not compulsory, but public schools and colleges maintained at the expense of the departments were



**COLOMBIA, VENEZUELA,
BRITISH & DUTCH GUIANA,
ECUADOR, PERU, CHILE,
BOLIVIA, PARAGUAY,
ARGENTINE REPUBLIC
AND PART OF
BRAZIL.**

SCALE OF MILES ON EQUATOR.

- Population of places is indicated by different lettering, thus;
- 100,000 and over. **L**
- 50,000 to 100,000. **Q**
- 10,000 to 50,000. **C**
- 5,000 to 10,000. **T**
- Smaller Places. **•**
- Railroads **—**

COLOMBIA

attended in 1897 by 143,076 pupils. The federal government maintains a national university that has faculties of philosophy and letters, jurisprudence, medicine and natural sciences, and mathematics and engineering. Between 1,500 and 1,600 students are usually enrolled at this institution. Schools of secondary education, normal schools, an artisans' institute, an academy of music, and an institute of the fine arts are also supported by the nation. In addition to these there are many private schools, and several colleges relying wholly upon their own revenues. Before the civil war of 1899 an increase was noted in the provision for the free instruction of the people.

Local Government.—In each of the departments there is a legislative body, known as the departmental assembly, composed of deputies elected directly by the citizens in the ratio of one deputy for each 12,000 inhabitants. These assemblies regulate local affairs and expenditures, and choose members of the national senate. Governors of departments, being appointed by the president, and removed at his discretion, are regarded as local agents of the national administration, and at the same time chiefs of the departmental administrations. The municipal districts are controlled by alcaldes who are agents of the governors.

History.—The earliest voyages to the Colombian coast are mentioned in DISCOVERIES. In 1508 the Spanish crown granted to Ojeda the district between Cape Vela and the Gulf of Darien, and to Nicuesa the country from the Gulf of Darien to Cape Gracias á Dios. The two territories were united in 1514. Balboa's discovery of the "Southern Sea" was followed by the removal of colonists to the Pacific coast and the founding of the city of Panamá. (See BALBOA, DABAIBA, DARIEN, EL DORADO, and DAVILA.) Starting from Santa Marta 6 Aug. 1536, Gonzalo Jiménez de Quesada led 700 infantry and 80 horsemen into the mountains of New Granada (now Colombia), and took the Indian capital. Colonies were established in the table-lands and along the coasts. The city of Medina was founded in 1670 by Fray Alonso Ronquillo of the order of Preaching Friars. In 1719 the natives destroyed the Spanish colonies on the Pacific slope. New Granada became a viceroyalty in 1740, having been administered previously as a simple presidency, except in 1718-19. In 1810 an insurrection against the government of Spain began. In 1819 New Granada and Venezuela were united, Ecuador joining the union two years later. The country thus formed was called the Republic of Colombia. (See BOLIVAR.) The efforts of Spain to retain these colonies ceased in 1824. Six years later the Colombian union was dissolved, Venezuela and Ecuador having withdrawn; and the republic of New Granada was established in 1831, its territory corresponding to that of the present republic of Colombia.

New Granada was at first divided into five departments, namely: Boyacá, Cauca, Cundinamarca, the Isthmus, and Magdalena. Lack of coherence caused a civil war in 1840; Panamá and Veragua unsuccessfully sought independence in 1841. From 1849 to 1857 the Liberal party controlled the government. In 1853 the right was granted to the departments to elect their governors by popular vote, and the powers of the provincial legislative bodies were increased. New political divisions were organized soon

afterward — Panamá, etc. These claimed, and taught the older departments to claim, the privileges of semi-independent states. A civil war, beginning in 1859, resulted in a triumph for the liberal (States' Rights) party. Under the constitution of 1863 the name Colombia was reverted to, the official title being United States of Colombia. Nine sovereign states were formed, each authorized to maintain its own military forces without restriction, and to nullify the federal laws. Insurrections made steady progress impossible until a reasonable degree of federal control was asserted. In 1880, Rafael Nuñez became president. His influence secured to the national government the right to use its forces for the suppression of insurrections in the several states. A national (government) bank was incorporated; diplomatic relations were established with Spain; the question of the boundary between Colombia and Venezuela was submitted to arbitration. Nuñez held the same office, which he made important, again in 1884 and 1886. In 1891 he was elected for the fourth time, but allowed Vice-President Caro to assume his duties.

A new constitution, which is still in force, was adopted in 1886. By this the states were reduced to departments, with governors appointed by the president of the republic, and legislative assemblies elected by the people. The president's term of office was extended from two to six years. Colombia passed from the extreme of a loose federation to that of a centralized republic. Subsequent revolutions have shown the desire of the Liberals to return to the old irresponsibility. In 1892 subsidies were granted for the construction of several important railways, and new cable lines along the coast and telegraph lines in the interior were authorized. Two years later a law was passed providing for the free coinage of gold and the redemption of the paper currency. Very little progress was made, however; on the contrary the means of communication and transportation, as well as the medium of exchange, have gone from bad to worse in the last few years. The rebellion of 1895 was suppressed in 45 days, but a civil war which broke out 17 Oct. 1899, proved to be more ruinous than any preceding conflict. The Liberals attempted by force of arms to drive the Conservatives from power. An issue which, in a republic, should be settled at the polls, cost the lives of 50,000 soldiers, while among the wretched non-combatants the number of deaths from privation and disease was vastly greater. As usual, the department of Panamá was a centre of disturbance. American marines were landed to guard the stations and railway at Colón and Panamá, in accordance with the treaty of 1846 between the United States and New Granada, by the terms of which the United States guaranteed the neutrality of the isthmus and assumed the obligation to protect free transit between the ports mentioned.

Toward the end of 1902 the flame of civil war finally went out. The government was almost destitute of money; it could neither pay interest on the national debt nor meet current expenses. Congressional elections were held throughout the country. The most important matter to come before that Congress was the question of ratifying a convention concluded at Washington 22 Jan. 1903, between the secretary of state of the United States of America and the chargé d'affaires of Colombia, for the con-

COLOMBO — COLÓN

struction of a ship canal to connect the Atlantic and Pacific oceans. The French Panama Company, formed in 1881, had suspended operations in 1889, and in 1894 a new company had been organized, securing a concession for 10 years, which term was subsequently extended by six years. (See ISTHMIAN CANALS, AMERICAN.) The board of this company had offered (4 Jan. 1902) to sell all its property and rights to the United States for \$40,000,000. The Panamá route had been approved by the United States Isthmian Canal Commission. After a long discussion in the United States Senate, the convention was submitted to the Colombian Congress, the Constitution of 1886 providing that ratification by both Houses is requisite for the validity of such an agreement as that relating to the Panamá Canal.

The convention just referred to, commonly known as the Hay-Herrán treaty, was defeated at Bogotá, 24 members of the Senate voting on 12 Aug. 1903 to reject it. A counter-proposition prepared by a commission (29 Aug.) was debated for a while, but not adopted. The adjournment of the Colombian Congress on 31 Oct. was followed almost immediately by the outbreak of a carefully planned "Separatist" movement in Panamá. Independence was proclaimed 3 Nov., and the Colombian army and navy officers in the principal city of that department were imprisoned. A provisional government was organized. American warships were ordered to the Isthmus; marines landed at Colón; and the Colombian troops withdrew from that town. On 6 Nov. the government of the United States entered into relations with the government of the Republic of Panamá, and on 13 Nov. M. Philippe Bunau-Varilla was formally received by President Roosevelt as minister of the new country. At that time hostile demonstrations against the Colombian government occurred at Bogotá, and another revolution seemed imminent.

Arbitration.—While political factions have continued to resort to arms for the settlement of differences of opinion within the nation's boundaries, the better sentiment of an increasing class of educated people has begun to make itself felt in the disputes with neighboring republics touching the location of those boundaries. Arbitration has repeatedly been chosen in place of foreign wars. The award by the queen regent of Spain, 16 March 1891, defined the frontier on the Venezuelan side. An agreement was made 15 Dec. 1894 for submitting to arbitration the question as to the southern line between Colombia and Ecuador and Peru. President Loubet of France acted as arbitrator of the boundary dispute with Costa Rica, rendering a decision 11 Sept. 1900.

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MARRION WILCOX.

Colombo, kō-lōm'bō, Ceylon, the capital, a seaport on the southwest coast, near the mouth of the Kelani River, and about 70 miles southwest of Kandy, the principal place on the island. It is a handsome town, and a portion of it, comprising most of the best houses, is within the walls of its very extensive fort, which occupies a projecting point of land, and embraces a circumference of nearly one and a fourth miles. The houses of the Europeans outside the town are very beautifully situated, especially those near the sea. There are several bazaars or market-places. The public buildings comprise the government offices, government house, hall of the supreme court, the valuable museum, etc. Some of the noted buildings are an old Dutch church, Presbyterian, Anglican, and Roman Catholic churches, hotels, orphan asylum, military hospital, and barracks, the town-hall, the railway station, the Colombo Royal College, St. Thomas' College, and Wesley college. The Moors have two handsome mosques with minarets; the Hindus also have their temples, rudely sculptured. Water is brought from a distance of 30 miles to the town, and there are extensive gas-works. The harbor was formerly capable of receiving small vessels only, and large ships had to cast anchor upward of a mile from the shore, exposed to the southwest monsoon; but a breakwater now gives complete shelter, and Colombo is the regular calling station for the large steamers bound for Bombay, Madras, Calcutta, the Straits, China, Australia, etc. It is the chief port of Ceylon, its exports and imports including the great bulk of the goods sent from and brought to the island. Pop. (1901) 154,556.

Colon, sometimes called **Aspinwall**, Panamá, a town of 5,000 inhabitants on the northern side of the Isthmus of Panamá, connected with the city of Panamá by a railway 49 miles in length. During the civil war in 1885 it was partly burned, but has been rebuilt. It stands upon an island which divides an inlet of the sea into the ports called Manzanillo and Naos, or Newbay. American marines and sailors were landed there during the revolutions which began in 1885, 1899, and 1903, in accordance with the treaty by which the United States guarantees to preserve from interruption free transit across the isthmus.

Colón, kō-lōn', Cuba, a town and district of the province of Matanzas. Area of the district 114 square miles. Area cultivated, 245.03 caballerias. (This was 498.91 caballerias in 1895.) Races, occupation, etc., for the district: Native whites, 5,706; foreign whites, 824; negroes, 2,856; mixed, 2,432; Chinese, 377; persons 10 years of age or over who can neither read nor write, 5,467; engaged in agriculture or mining, 2,741; in trade and transportation, 600; manufacturing and mechanical industries, 576; professional service, 61; domestic and personal service, 984; without gainful occupation, 7,233; number of occupied dwellings, 2,199; number of families, 2,624; persons to a family, 4.7. The following statistics are from the United States War Department census of 1899: Population of the town, 7,175; of the district, 12,195 in 1899, as against 16,679 in 1887.

COLON — COLONIAL ANIMALS

Colón, Venezuela, a federal territory embracing the Venezuelan islands in the Caribbean Sea, except those belonging to the state of Rivas. The islands forming the territory are: Blanquilla, Los Hermanos, Frailes, Sola, Testigos, Venados, Esmeraldas, Caracas, Picudas, Chimanas, Borracha, Arapos, Monos, Píritu, Farallón, Ocumare, Orchila, Los Roques, Aves, Los Monjes, and several smaller ones. The natural products are phosphate of lime, guano, lime, woods, and fish. Large quantities of the plant called orchila are exported for industrial purposes. There are salt deposits in Los Roques. Gran Roque is the capital. Nearly all of the islands are uninhabited. The territory is directly dependent upon the national government, and, like the territory of Amazonas, is governed by special laws.

Co'lon, that part of the intestine that extends from the ileo-cæcal valve to the rectum, practically the entire large intestine. Its position in the abdomen is at first vertical, on the right side,—the ascending colon; then horizontal, the transverse colon, situated just beneath and behind the liver and stomach, going from right to left. It then descends, on the left side, to the sigmoid flexure in the left flank, and then bends abruptly inward and backward to end in the rectum, just in front of the spinal column. It is about four feet in length, and two inches in diameter, is made up of the same kinds of tissue as the intestine, but is rougher and more sacculated. In the large intestine the fecal matter loses its surplus water, and is molded slowly into form for final discharge through the rectum and anus. See ABDOMEN; INTESTINE.

Colon Bacillus, a very common bacterium (*Bacillus coli communis*), of the intestinal canal of many animals, including man, in which place it seems to serve some useful functions in the breaking down of food-stuffs, although, for lower animals at least, it is not indispensable for proper digestive processes. It is a short motile bacillus and closely resembles the typhoid organism, from which it is separated only by careful bacterial technic. While a normal inhabitant of the intestines of man, it may in abnormal situations be a cause of disease-processes. Its presence or absence in potable waters is of service in determining the presence of contamination of a water supply by animal fecal matter. See TYPHOID BACILLUS.

Colonel, kër-nël, the commander of a regiment, whether of horse, foot, or artillery. Any rank above a colonel constitutes the bearer of it a general officer. In the British service the rank of colonel is honorary, and is usually bestowed upon officers of superior rank and princes of the blood, who receive the emoluments of it in addition to those of their regular rank. The actual commander of the regiment is the lieutenant-colonel. In some of the Continental armies also the colonelcy is an honorary post held by persons of rank in the army or the state. In the United States army and the State militias the title of colonel is not honorary, but entails actual service as commander of his regiment.

Colonia Bolívar, kō-lōn'-yā bō-lē'vār, Venezuela, in the Sucre district of the old state of Miranda, about 30 miles from Caracas and five miles from Guatire. It is one of the two

colonies which were established in 1874 with the design of encouraging immigration. The main products are coffee and starch. The principal town is Araitha. The Araitha River and several other streams irrigate the soil.

Colonia Catalana, kā-tā-lā'nā, Paraguay, situated in the department of Villa del Rosario. Cultivated area, 58 cuabras.

Colonia Cosme, kōz'mā, Paraguay, in the department of Caazapá, a colony recently founded by Australians, who have already a school, several stores, a carpenter shop, a shoe factory, a saw-mill, a tannery, and 65 cuabras under cultivation.

Colonia Independencia, ēn''dā-pān-dān''-sē-ā, Venezuela, in the Altigracia district of the old state of Miranda, about 70 miles from Caracas. Its area is 555 square kilometers; its altitude 5,400 feet above sea-level; Taguacita is its principal town, and its agricultural products are coffee, sugarcane, yucca, and cacao. There are extensive forests and two rivers. The colony was founded in 1874. See COLONIA BOLIVAR.

Colonia Nacional, nā-thē-ō-nāl', Paraguay, formerly called "President Gonzalez's Colony," situated in the department of Caazapá. It covers an area of 12 square leagues, crossed by the railway from Asunción to Villa Encarnación. The ground is hilly, well watered, and covered with fine timber. Maize (harvested as often as three times a year), sugarcane, tobacco, wheat, potatoes, coffee, vines, rice, and lucerne, all grow readily in the valleys or on the hill-sides. The export trade in 1901 was valued at \$245,971. Pop. 847. For other colonies, see PARAGUAY.

Colonia, Uruguay, a department on the Plata, below the Uruguay River. The uplands are barren, but in the fertile valleys and plains are numerous European colonies, engaged in agriculture and stock raising. The capital, Colonia del Sacramento, on the Plata, about 100 miles above Montevideo, has a good harbor, a dock for vessels of 1,000 tons, ruined fortifications, and some 1,500 inhabitants. Area of the department 2,192 square miles; pop. 50,300.

Colonial, or **Compound Animals**, organisms which cannot be fairly regarded as unities, but consist of numerous more or less similar individuals united in a common life. Among the usually single-celled simplest animals or *Protozoa*, loose colonies not unfrequently occur, and are of not a little importance as suggestions of the bridge between the single-celled and many-celled animals. Such colonies arise when the original cell instead of reproducing discontinuously, retains its daughter-cells in union with itself or with one another, much like the segments of the egg-cell of a higher animal. By sacrifice of individuality at the time of reproduction, a higher unity is formed. In the same way a simple cup-shaped sponge, by continuous budding, forms a colony of similar forms, which may possess more or less distinct individuality. The common fresh-water *Hydra*, to mount a step higher, buds off daughter *Hydræ*, which remain for a while connected with the parent organism, and make it temporarily colonial.

Many marine hydroids retain their polyps permanently as constituents of such a complex organism, and, as a differentiation of these into

COLONIAL DAMES OF AMERICA—COLONIAL WARS IN AMERICA

nutritive and reproductive, and often into still other kinds, takes place, a higher order of more complex individuality arises; the polyp life is in part subordinated to the colony life. Among the most perfectly organized of such colonies are the floating *Siphonophora* (such as the Portuguese man-of-war), in which five or six perfectly differentiated and specialized kinds of zooids act together in mutual interdependence to support the whole. In most cases such zooids are incapable of performing any but the one function, or set of functions, to which they are adapted, and consequently cannot sustain independent life. This is one way of approaching the questions of individuality and of organization of the higher *Metazoa*. See COMPARATIVE ANATOMY.

For social communities or colonies composed of numerous free individuals all working together for mutual benefit, and how new colonies are founded, see ANT; BEE; WASP; TERMITES, etc.

Colonial Dames of America, The National Society of, an ancestral and patriotic organization of American women, founded 19 May 1892; and composed of one Colonial Society from each of the 13 original States, one society from the District of Columbia, and one associate society from each of the non-colonial States. The objects of the National Society are: to preserve colonial history, traditions, manuscripts, records, relics, and buildings; to perpetuate the brave deeds, and glorious memory of the colonists, and to engender and encourage patriotism. To be eligible to membership, a woman must be descended from some worthy ancestor, who rendered valuable service to the colonies, and who became a resident of America previous to 1750. Memberships are obtained only upon invitation from those already enrolled, and must be procured through admittance into the Colonial Society, of the ancestral State, where the service of the ancestor was rendered. The work of the society has been patriotic. During the Cuban war nurses and supplies for the sick were supplied; at the close of the war a splendid monument, in Arlington cemetery, Washington, D. C., "to the memory of the soldiers and sailors, who gave up their lives in the late war with Spain," was erected by the society "in the name of the Women of the Nation." One of the most valuable and interesting collections of colonial relics and furnishings is under the control of the New York Society at the old Van Cortlandt manor house in Van Cortlandt Park. Churches and colonial houses of historical importance have been restored; historical sites marked with tablets; prizes awarded for essays on patriotic and historical subjects, to pupils of public schools and colleges. A complete list of the soldiers and sailors, who fell in the Cuban campaign, form the contents of a Record Book, compiled by the society. Great credit is due this organization for preserving many historical places which otherwise might have been destroyed. The society numbers (1903) 4,000 members.

Colonial Office, the English government office where business connected with the government of the colonies is carried on. A secretary of state for the colonies was first appointed in 1768. In 1782 the title was abolished again and

the colonies were placed under the home secretary. In 1801 the jurisdiction was transferred to the secretary for war. In 1854 the original arrangement was reverted to, and there have been colonial secretaries ever since.

Colonial System. See COLONIES AND COLONIZATION.

Colonial Wars in America. A résumé of the colonial wars in America must of necessity omit many local disturbances which were of importance historically and which the student can find graphically described in many of the volumes included in the bibliography at the close of this article. Some of the most important are here chronologically presented.

1607. Jamestown, Va.—Although Capt. Gabriel Archer and a sailor were severely wounded by arrows tipped with deer's-horn and sharp stones, the night the English landed in Virginia, the first real conflict in American colonial history came two weeks after the Jamestown settlement, at the end of May, 1607, 200 Indians being repulsed by the settlers under Capt. Edward-Maria Wingfield. English casualties, one killed; 11 wounded. From this encounter to the battle of Lexington (q.v.), April 19, 1775, scarcely a generation in the several colonies reached manhood, without knowing the horrors of war.

1620. Plymouth, Mass.—The Pilgrims of New England had their first encounter with the dusky Nausite tribe, whose arrows were headed with hart's-horn, eagle's-claws, and brass, Dec. 8, 1620, and for over half a century the warfare continued with exacerbations of varying ferocity.

1622. Virginia.—Two years later their kinspeople at Jamestown escaped annihilation by the warning of a converted Indian. March 22, at midday, 347 men, women, and children were slain, by supposedly friendly savages, among the scattered hamlets along both banks of the river.

1633-7. Pequot War.—The Pequot Indians, in 1633, killed several English traders who came to their Connecticut River territory; 1634 found the Pequots at war with the Narragansett tribe, and hostile to the Dutch as well. Then the New England colonists prepared for the inevitable encounter. Sassacus reigned as Pequot chief. About this time John Oldham and two young lads were slain by the savages at Block Island. Governor Endicott promptly sent a force which destroyed the major part of this band. The Pequots then tried to enlist the cooperation of the Narragansetts, but this failed, owing to the influence exerted by Roger Williams over this tribe. The murder of 30 men and women followed. Connecticut, in May, 1637, placed John Mason in command of troops contributed from Massachusetts and Plymouth under Capt. John Underhill, allies being Mohegans, Uncas their sachem, and 400 Narragansetts and Nyantics. The desperate battle of Pequot Hill, Groton, Conn., was fought May 26, 1637. Mason says: "Most courageously these Pequeats behaved themselves"; but, "such a dreadful Terror did the Almighty let fall upon their Spirits that they would fly from us and run into the very Flames, where many of them perished." Nearly 800 Indians were slain in an hour; only two English were killed, and 20 wounded. Activities ceased in August, and the

COLONIAL WARS IN AMERICA

next year a treaty was concluded between the colonies and the tribes.

1642-7. Ingle's Rebellion.—Indians began to molest Europeans in Maryland in 1642, and following these attacks came Ingle's Rebellion, July, 1643, aided by Clayborne, and which caused internal discord in the colony until peace was declared between contending parties in 1647.

1643-7. Kieft's War.—Kieft was appointed governor of New Netherlands in 1638. In the winter of 1643 he made war on the Mohawks, causing an outburst of hostilities among the Algonquin tribes. Massacres and conflagrations continued through the winter and following summer. John Underhill of Connecticut commanded the troops, and successfully routed the Long Island tribes. In March, 1644, Underhill, with 150 Dutch soldiers, landed at Greenwich, Conn., attacked an Indian village of 700, slew 180 in an hour, then set fire to the village, causing the death of 500 Indians by fire and sword. Kieft proclaimed a public thanksgiving for this victory. Nearly all Dutch farms and 1,600 Indians had been destroyed when Peter Stuyvesant succeeded Kieft in 1647, and peace was established.

1644. Virginia.—On Holy Thursday, 1644, Opechancanough and his warriors killed 500 white settlers in Virginia. Vigorous measures were taken by settlers, and the Indians were dispersed, their villages and the Powhatan confederacy (embracing nearly 50 petty tribes) destroyed, their chief captured and shot.

1648-56. New Sweden.—In April 1638 Peter Minuit, with his colony of Swedes, reached Delaware Bay. The colony was unusually prosperous, while Dutch interests there waned. Disputes arose as to titles of land; in 1648 the Dutch tried to erect a fort and houses on the Schuylkill, but were repulsed by the Swedes. Continued friction between the two races resulted, although Stuyvesant of New Netherlands and Printz of New Sweden agreed to be, and for three years were, allies. First one side would capture a fort, then the other; until, in 1656, after discussion by the States-General and Sweden (which came to naught), the city of Amsterdam bought the West India Company's interest on the South River (Delaware), and the colony of New Amstel was launched, while the authority of New Netherlands ceased.

1660. Bacon's Rebellion.—See BACON'S REBELLION.

1664-73. New Netherlands.—England seized New Netherlands Sept. 8, 1664, and war was formally declared in March, 1665. England suffered greatly at hands of Holland in 1666, but continued to hold her American conquests. August 8, 1673, a Dutch fleet of 23 vessels, with 1,600 men, arrived off Staten Island, and on the 9th anchored off the fort. The Dutch commander, Evertsen, at length opened fire, which the fort returned, but the fort surrendered and the Dutch flag was raised.

1666. French and Iroquois.—The French waged war with the Iroquois and other tribes for 60 years, coming down from Canada, invading and destroying their villages. As a result, peaceful white settlers suffered from Indian retaliation.

1675. King Philip's War.—John Sassamon or Sausaman, secretary and interpreter of the Wampanoags' chief (he had been a pupil of

the apostle Eliot) heard of plot to exterminate the English, and reported it to the Plymouth authorities. King Philip, second son of Massasoit, who had been chief sachem of tribes between Charles River and Narragansett Bay, was summoned and examined by the authorities. Learning of the informer, he caused his death, Jan. 29, 1675. His slayers were, in turn, executed by the authorities. Then followed a series of Indian retaliations; eight or nine whites were killed at Swansy; in June, companies from Massachusetts and Plymouth drove Pokanokets from Mount Hope; Philip fled to Nipmucks, who killed Capt. Hutchinson and 16 others; Brookfield was burned; Deerfield and Northfield attacked; Capt. Beers and 20 men from Hadley slain; Capt. Lathrop and 80 men killed at Bloody Brook, near Deerfield, which was then burned; and Springfield and Hatfield were attacked. War continued through the summer, and in October, fearing an attack from the Narragansetts, Governor Winslow with 1,000 men marched against them. All troops were assembled December 18, and on the 19th began the memorable battle, which ended in the complete rout of the once powerful Narragansetts. On Feb. 10, 1676, occurred the Lancaster massacre by the Nipmucks; and this, taken with the series of calamities at Medfield, Worcester, Marlborough, Mendon, Groton, Weymouth, Sudbury, Chelmsford, Springfield, Wrentham, Hatfield, Hadley, North Hampton, Andover, and Bridgewater, makes an appalling list of horrors. War was actively waged by Canonchet, son of Miantonomo, until his capture by Capt. Dennison and the Connecticut troops, and subsequent death at hands of Mohegans. August 12 King Philip was killed at Bristol and the war was at an end.

1680. Port Royal, S. C.—The Spaniards from Florida attacked the Scotch settlement at Port Royal, S. C., in 1680, completely destroying it. A force of 400 men was raised to retaliate, but this plan was forbidden by the proprietors, inasmuch as the colonists were supposed to be not wholly blameless.

1687-9. French and Senecas: Montreal.—The French waged war with Senecas 1687, defeating them. Indians then destroyed Fort Frontenac. In 1689 the Iroquois attacked Montreal causing great devastation and loss of about 1,000 French.

1689-91. Leisler's Rebellion.—See LEISLER'S REBELLION.

1690. First Intercolonial War: King William's War: Quebec.—War between England and France was declared in 1689. The French in Canada planned an attack on Boston and New York. They came down from Canada with Indian allies; attacked Schenectady Feb. 8, 1690; Salmon Falls, March 27; horrible massacres ensued, and the colonies were aroused. March 19 the General Court of Massachusetts proposed a congress, at which measures for their protection should be arranged. The several colonial bodies were notified. Representatives from Massachusetts, Plymouth, Connecticut, and New York met at New York. On May 1 they signed an agreement to send 855 men for the support of Albany and, "by the help of Almighty God, subduing the French and Indian Enemies." Attempts to conquer Acadia and so move on Quebec, together with a plan to secure Montreal *via* Lake Champlain,

COLONIAL WARS IN AMERICA

followed. Acadia and Port Royal were captured by New England men under Sir William Phipps; then the force pressed on to Quebec, but not securing the desired support of Major Fitz John Winthrop, their object was not accomplished.

1696. *Frontenac's Expedition*.—Frontenac's expedition against Iroquois, Oneida, and Onondaga tribes, occurred in 1696, when he was 74 years of age. The tribes were humbled by him, but not subdued.

1702-10. *Second Intercolonial War: Queen Anne's War*.—War was declared May 15, 1702. In August, 1703, the French and Indians attacked Wells, Saco, and Casco. Deerfield and Lancaster also suffered. In May, 1704, Col. Benjamin Church, with troops, sailed from Boston, against Acadian settlements. In 1705 French and Indians destroyed Petit Havre and St. John's, N. F. In 1709 Haverhill was attacked by French and Indians; Oct. 16, 1710, Port Royal captured by the English under Nicholson, and renamed Annapolis, in honor of the queen. Varying degrees of Indian hostility were experienced along the coast to the Kennebec River, until 1725, when peace prevailed.

1703-15. *Southern Wars: Charlestown*.—On Jan. 15, 1703, a battle was fought between Carolina troops under Col. Moore and the Spanish forces under Don Juan Mexia, and 800 of the latter were killed. In August, 1706, Charlestown was attacked by a Spanish fleet, with small loss to either side.

1711. *Tuscarora War*.—September 22, 1711, Tuscaroras and Corees slaughtered inhabitants along the Roanoke River and Pamlico Sound. During several days they killed the whites along Albemarle Sound. Col. John Barnwell, with South Carolina troops and Indian allies, guided an expedition which made several attempts to drive them away; finally captured 800 in a fort; fought a severe battle Jan. 28, 1712, and killed 400 warriors. The remaining hostile Tuscaroras migrated to Oneida Lake, joining the Iroquois confederacy.

1714-15. *Yemassee War*.—The Yemassee war was instigated, so it is claimed, by the Spaniards. A series of Indian outbreaks occurred in 1714-15, in one encounter 400 South Carolinians being killed. The Yemassees were driven out of Carolina into Florida, but disastrous warfare continued, hundreds suffering brutally at hands of savages.

1739-48. *War with Spaniards in Florida: War of Jenkins' Ear: Carthagena*.—The English South Sea Company, under the Treaty of Utrecht, was permitted to supply slaves to Spanish colonies. A smuggling-trade developed, which a Spanish fleet (*guarda costas*) tried to discourage. England and her colonies heard of terrible severities imposed by Spaniards on suspects captured. Runaway slaves from South Carolina made their way to Florida, were well received, protected, and given grants of land by the Spaniards, who declined to return slaves. In 1738 Oglethorpe, appointed military commander of Georgia and South Carolina, returned from England with a regiment. The same year, Capt. Jenkins, skipper of the ship *Rebecca*, was examined in the House of Commons. He described how, having unjustly accused him of smuggling, the Spaniards first hung him at the yardarm, then lowered him, and cut off his ear, telling him to take it to

his king. Public clamor caused Walpole to declare war Oct. 23, 1739. An English fleet under Admiral Vernon visited the Isthmus of Darien, and captured Porto Bello. Oglethorpe, having perfected a treaty with the Creek Indians, called on them and South Carolina for aid. Although an expedition captured Fort Picolata (thus preserving navigation of St. John's River, and preventing Spaniards communicating with posts at St. Mark's and Pensacola), Oglethorpe found the 1,200 men under his command unable to make any impression on St. Augustine, and gave up the siege of that place after heavy loss to his Highland regiment, and desertion of Indians and some Carolina troops. In the spring of 1741 Admiral Vernon, co-operating with land forces under Gen. Wentworth, failed in an assault on Carthagena. A fleet under Commodore Anson secured several valuable Spanish prizes. The Peruvian town of Paita was destroyed. In 1742 a Spanish fleet of 56 vessels, carrying 7,000 or 8,000 men, fitted out at Havana, and appeared off the Georgia coast at the end of June. Its attempts to capture the island of Amelia and forts at Frederica were frustrated by Gen. Oglethorpe. July 7, 1743, the Spaniards lost heavily at the battle of Bloody Marsh; July 24 Oglethorpe proclaimed a general thanksgiving for the end of the invasion.

The following reproduction of the governor's speech to the General Assembly of his Majesty's colony of New York is of interest. It is for the first time reproduced from the only known copy, in possession of the New York Historical Society, and bears upon this period of martial activity, giving an idea of the style of appeal from king to colonists.

JOURNAL OF THE NOTES AND PROCEEDINGS OF THE GENERAL ASSEMBLY OF HIS MAJESTY'S COLONY OF NEW YORK, 30TH DAY OF JUNE 1740.

Gentlemen: His Majesty having been called upon, by repeated Provocations, to declare War against Spain, and being determined, by God's Assistance in so just a Cause to Vindicate the Honor of His Imperial Crown, to Revenge the Injuries done to His Subjects, to Assert their undoubted Rights of Navigation, and by all possible Means, to Attack, Annoy, and Distress a Nation that has treated His People with such Insolence and Barbarity, has given Orders for the Equipping and setting forth an Expedition against the Territories of the Catholic King in the West-Indies, which will consist of a large Squadron of Ships of War, and of a considerable Body of Land Forces, with a suitable Train of Artillery, Store-ships, and all Things requisite: and has likewise given Orders to raise the Body of Troops in His Majesty's Colonies on the Continent of North America, to join those to be sent from England, at a particular Rendezvous. I have, in Obedience to His Majesty's Commands, taken the best Measures in my power, to invite and encourage in His Majesty's faithful Subjects in this Province, cheerfully to enlist in His Majesty's Service for this Expedition: But it is in your Power to do much more, by giving a Bounty to every Man who inlists in this Service. And I am perswaded it will be such as will shew the World, that you will not be behind the most Zealous of His Majesty's Subjects, in promoting this Glorious Enterprise. Now, although by the Success of this Expedition, the Commerce and Navigation of this Province, to and from the West-Indies, will not only be secured, but greatly increased by the large Possessions which, by the blessing of God on His Majesty's Arms, will fall into his Majesty's hands. And although by such acquisitions a Door will be opened for a larger Consumption of Provisions (the Staple of this Province) whereby the Farmer, as well as the Merchant, may be greatly enriched, Yet, it is but little that His Majesty expects from his Dutiful and Loyal Subjects of this Province, towards the Expense of this Expedition. And I am commanded by His Majesty, to Recommend it to you, in His Name, as I do most earnestly, That you provide Victuals, Transports, and all other Necessaries for the Troops

COLONIAL WARS IN AMERICA

to be raised in this Province, except Cloathes, Tents, Arms, Ammunition and Pay till their arrival at the general Rendezvous in the West-Indies from which Time the Said Transports are to enter into His Majesty's Pay. In the doing whereof, I hope you will loose no Time, that the Expedition may not be retarded. His Majesty's Expectations are so just and reasonable, and the Prospect of Advantage to the Province so clear, that I perswade myself, you will cheerfully and immediately provide for the Expence of what is recommended to you. These Things being Matter of the highest Importance, I will not now take off your Attention, by Recommending anything else to your Consideration, hoping you will give this Business the utmost Dispatch, wherein you will, in a very particular manner, Recommend yourselves and your Country to His Majesty, Whom God long Preserve.

GEORGE CLARK.

A bill covering the above passed the assembly July 10, 1740, and Cols. Morris and Philipse carried the same to the council for its concurrence. It was passed by the council July 11, and signed by the lieutenant-governor July 12.

1744-48. *Third Intercolonial War: King George's War.*—May 13, 1744, Governor Duquesnel of Cape Breton captured an English settlement at the island of Canso, near Nova Scotia; destroyed the fort, removing all prisoners to Louisburg; but was unsuccessful in an attempt against Annapolis, N. S., and Placentia, N. F. New England colonists declared war on Nova Scotia Indians, who attacked Annapolis and planned the capture of Louisburg. Men, money, and supplies were contributed by Pennsylvania, New Jersey, New York, Connecticut, Rhode Island, and New Hampshire, but the chief burden was imposed on Massachusetts. Command of the forces (some 4,000 men) was given to William Pepperell, who left Boston in April, 1745, Commodore Warren, commanding in the West Indies, furnishing ships of convoy. Five assaults were made on an island battery protecting the harbor before the French surrendered, June 17. For this success Pepperell was made a baronet. An expedition the following year proved unsuccessful, and Louisburg was returned to the French by the Treaty of Aix-la-Chapelle, Oct. 7, 1748.

1754. *Great Meadows.*—In December, 1753, George Washington carried a request from Gov. Dinwiddie of Virginia to the French commander of Forts Vernango (confluence of French Creek and Allegheny River, now Franklin, Pa.) and Le Bœuf (west fork of French Creek, now Waterford, Pa.) that he retire from territory claimed by the English; request was refused. Gov. Dinwiddie then ordered a fort constructed at the forks of the Ohio, and while work was in progress the French appeared and the English retired. A regiment organized under Col. Joshua Fry, with Washington second in command, pushed on with 150 men. May 28, 1754, when near Great Meadows, the French were met in a glen. In ensuing hostilities the French commander, Jumonville, was killed, and those under him captured. Washington retired to Great Meadows and threw up intrenchments, awaiting Col. Fry's force, which finally arrived. Col. Fry had died suddenly. Washington made a second advance, which proved ineffectual against a French force of 700, and he retired with the honors of war, July 3, 1754.

The same month Benjamin Franklin, Thomas Penn, and others assembled at Albany by request of the "Lords of Trade" (a standing

committee of England's privy council), hoping to make an agreement with the chiefs of the Six Nations for protection in the event of further hostilities with France. Franklin's plan was unanimously approved at this congress, but the several assemblies failed to ratify it. Had his plan been adopted, it is said, the several colonies would have been united and strong enough to withstand attacks from enemies without England's assistance and the later pretense for unjust taxation. Thus the Revolutionary struggle might have been averted.

1755-63. *Seven Years' War: French and Indian Wars: Braddock's Defeat.*—The English government, in 1755, placed Gen. Braddock over a force intended to drive the French from the Ohio Valley. Washington was on his staff. Braddock planned the capture of Fort Duquesne, at the confluence of the Allegheny and Monongahela rivers. Untrained in methods of frontier warfare, having seen no enemy on his tedious march (April 2 to July 9), Braddock scoffed at the employment of scouts as he approached the immediate vicinity of the enemy, with the result that when his command was attacked it was completely defeated; half his 1,600 men killed or wounded, and he himself died from a wound received in the onslaught. His papers were captured by the French, who found therein all the English plans.

1755. *Battle of Lake George.*—At a council of war, called by Gen. Johnson at early morning Sept. 8, 1755, it was proposed to send 500 men to Fort Edward. The noted Indian King Hendrick, when consulted about this number, said: "If they are to fight they are too few; if to be killed, they are too many." The force was doubled. Johnson then proposed dividing it into three parties. Hendrick took several arrows, handed one of them to Johnson, requesting that he break it, which the general did; Hendrick then placed three arrows in the general's hand, saying: "Put them together and you can't break them: take them one by one and you will break them easily." This argument was conclusive. Col. Ephraim Williams led; Lieut.-Col. Whiting had second division; King Hendrick, with 250 Mohawks, was in advance of the Provincials. Rocky Brook was reached; here the enemy was in ambush; but for friendly warning from Senecas, troops would have perished. Col. Williams and King Hendrick lost their lives; Gen. Johnson was wounded; Lieut.-Col. Whiting conducted a successful retreat, followed by the French and Indian allies. Lieut.-Col. Cole, with 300 men, came from Lake George; a brilliant dash was made on the enemy, driving them and capturing Baron Dieskau. Col. Blanchard advanced from Fort Edward, where the firing had been heard, with 250 men; discovered 300 Indians resting at Rocky Brook; slew most of them. Among 500 lost by the French was Le Gardeur de St. Pierre, whom Washington had met the year before at Great Meadows.

1756-7. *Forts Oswego, Ontario, George, and William Henry.*—England declared war against France May 18, 1756. Gov. Shirley was commander-in-chief of colonial forces; Marquis de Montcalm general of French. Shirley slowly matured plans of attack on Crown Point and Fort Duquesne; meanwhile Montcalm destroyed three forts, Oswego, Ontario, and George. This activity of the enemy cost Shirley his position;

COLONIAL WARS IN AMERICA

the Earl of Loudon taking his place, Gen. Abercrombie second in command. In 1757 Montcalm attacked Fort William Henry, at head of Lake George, garrisoned by 2,264 regulars, under Col. Munroe. The attack lasted from August 3 to August 9, when a capitulation was signed.

1758. *Louisburg: Ticonderoga: Crown Point: DuQuesne.*—Three expeditions were proposed for 1758: the first against Louisburg; the second against Ticonderoga and Crown Point; the third against Fort DuQuesne. May, 1758, found Admiral Boscawen at Halifax with a fleet of 157 vessels (23 ships of the line, 18 frigates and transports). There were 12,000 men under Jeffery Amherst to co-operate with him. The attack on Louisburg began June 9, and lasted until July 26, when the garrison capitulated, becoming prisoners of war. Vast quantities of ammunition and stores, 218 cannon, and 18 mortars fell into the hands of the English.

Gen. Abercrombie led a force of 15,000 men against Ticonderoga, embarking on Lake George July 5; advanced toward the fort; experienced many difficulties, including a skirmish in which Lord Howe was killed, and finally had to retreat. He lost about 2,000 men.

Lieut.-Col. John Bradstreet proposed an attack on Fort Frontenac (now Kingston, Canada); Abercrombie consented and gave him 3,000 men. This was successful toward the close of August; Bradstreet captured quantities of stores, ammunition, and cannon.

DuQuesne.—Early in July Gen. Forbes left Philadelphia en route to Fort DuQuesne, with Cherokee allies; Col. Bouquet was at Rays-town; in September Col. Washington joined Forbes; late in November Fort DuQuesne was in possession of colonial forces, receiving the name of Pittsburg in honor of the elder William Pitt.

1759. *Quebec.*—Maj.-Gen. James Wolfe was appointed to proceed against Quebec. He had ten battalions of infantry, six companies of rangers, artillery, engineers, and the Louisburg Grenadier Corps. Under Admiral Saunders were 22 ships of the line, 5 frigates, and several transports; Wolfe had, as brigadier-generals, Monckton, Townshend, and Murray; Col. Guy Carlton commanding the grenadiers, and Lieut.-Col. William Howe (brother of Lord Howe) the light infantry. At Quebec were more troops than the English had, under Montcalm, who placed them along the north shore, below the city, from St. Charles River to the Falls of Montmorency. Wolfe placed batteries within cannon-shot of Quebec at the west point of the Isle of Orleans, and at Point Levi. The lower town was destroyed; conflagrations occurring in the upper town by red-hot balls and shells. July 9 Wolfe crossed from the Isle of Orleans to the north branch of the St. Lawrence, camping below the Montmorency; July 18 he made a successful reconnoitre. His attack on redoubts at the ford was unsuccessful, with a loss of 400 men and two vessels. While ill, and awaiting the arrival of Gen. Amherst, he called a council of war; and it was decided to draw Montcalm into the open field. Camp was broken and the troops moved to Point Levi.

De Bourgainville, with 1,500 French, guarded the north shore to prevent landing. The English admiral deceived the French by moving his

vessels below the real landing-place (Wolfe's Cove, near Cape Diamond). Ascent was made to the Plains of Abraham; the memorable battle was fought, Wolfe and Montcalm both dying from wounds therein received; and the citadel surrendered September 17 to Gen. Townshend.

Fort Niagara.—Soldiers under Prideaux landed July 1, 1759, within six miles of Fort Niagara. A sally was made July 11. Prideaux was killed by a bursting shell July 19; Amherst appointed Gen. Gage to succeed him; until his arrival Gen. Johnson carried on a siege; the fort surrendered July 25.

Presqu' Isle: Venango: Le Bœuf: Ticonderoga.—Col. Bouquet captured with ease Presqu' Isle, Venango, and LeBœuf. Gen. Amherst had 11,000 men for an attack on Ticonderoga, which he took late in July (the French having withdrawn), only losing 75 men in a skirmish. He also took Crown Point. The English now fortified these places.

1759-60. *Cherokee War.*—While the above events were transpiring trouble arose with the Cherokees, who had accompanied Gen. Forbes against Fort DuQuesne the previous year. On the return of the Cherokees numerous instances of loss of life occurred between Indians, Virginians, and Carolinians. Gov. Littleton, with 1,500 men, marched against the Cherokees, demanding surrender of the murderers; he received 22 Indian hostages as security for peace, and retired from the field owing to disease and insubordination in his command. The Cherokees attempted to take Fort Prince George, at the head of the Savannah. Hostages were placed in irons through fear of an effort to release them; one of them wounded a soldier, and his friends promptly killed all the Indians. This enraged the Cherokees, and war-parties were sent out in every direction and laid siege to the fort; the South Carolina assembly offered £25 for each Indian scalp, and voted to raise 1,000 men. Gen. Amherst sent 1,000 Scotch Highlanders under Col. Montgomery, who raised the blockade at Fort Prince George, and met Indians in June 1760. Victory was claimed by both sides. Montgomery retired to Charlestown, prepared to return north, by order of Gen. Amherst. Lieut.-Gov. Bull now ordered 400 regulars for frontier protection. Upper Cherokees besieged Fort Loudon so successfully that the garrison lived on horse-flesh until it surrendered under promise of protection to the settlement; the promise was broken, many lives lost, and many taken prisoners. In June, 1761, the Highland regiment returned and defeated the Cherokees with great slaughter. They sued for peace, which eventually was concluded.

1760. *Quebec.*—The delay caused in rebuilding and strengthening Ticonderoga and Crown Point prevented Amherst from moving on Montreal. The French had time to rally under De Levis, who succeeded Montcalm, and planned retaking Quebec. The plan was put in operation April 17, 1760. De Levis, with 10,000 men went down the river to Quebec, where Murray was in control. De Levis camped three miles from the city. On April 28 an attack was made, in which Murray lost 1,000 men and a train of artillery. The French loss was estimated at 300. De Levis built trenches about the city, preparing for a long siege. May 15 Swanton arrived and destroyed all the French ships at Quebec. The siege was raised May 17,

COLONIAL WARS IN AMERICA

and on Sept. 8, 1760, the English flag was raised in Montreal.

1762. *Martinique: Havana.*—Gen. Robert Monckton sailed from New York late in 1761 with two line-of-battle ships, 100 transports, and 12,000 regulars and colonials; in February, 1762, he captured Martinique; next, Fort Royal, St. Pierre, St. Vincent, Grenada, and St. Lucia surrendered; the French fleet was destroyed; on Aug. 12, 1762, Havana was captured by forces under the Duke of Albemarle, after a fierce struggle of 44 days, and great loss of life.

1763-4. *Pontiac's War.*—Pontiac, chief of the Mohawks, posed as friend of the English after their victories; in secret he was plotting against them with Algonquins, Wyandots, Senecas, and others. He planned simultaneous attacks on western posts in the spring of 1763. Major Gladwin, commanding at Detroit, was forewarned, and when Pontiac and his 60 chiefs appeared on May 6, they found the garrison under arms. The fort was unsuccessfully attacked for two months; then relief came from Fort Niagara. Capt. Ecuyer at Fort Pitt (Pittsburg, Pa.) was also prepared. At the first attack, June 22, the Indians were repulsed. The second attack, July 26, lasted four days, and the Indians were defeated. Gen. Amherst sent Col. Bouquet with 500 men to its relief; while en route, 25 miles east of the fort, he fought a stiff battle with Indians at Bushy Run, coming off victorious. In September, 1764, Col. Bouquet was again at Fort Pitt. Toward the close of November the Delawares and Shawnees returned 200 captive whites. This border war had caused much distress, and the following forts had been lost before Sir William Johnson and Bradstreet successfully treated with 2,000 representatives of the Ottawas, Ojibways, Iroquois, and Wyandots at Fort Niagara, and Pontiac's war was over:

May 16, 1763, Fort Sandusky.

May 25, Fort St. Joseph (at the mouth of St. Joseph River, Mich.).

May 31, Fort Onatanon (on the Wabash, Lafayette, Ind.).

June 2, Fort Michillimackinac (Mackinaw, Mich.).

June 17, Fort Presqu' Isle (Erie, Pa.).

June 18, Forts Le Bœuf (Erie County, Pa.), Venango (Venango County), and forts at Carlisle and Bedford, Pa.

1774. *Lord Dunmore's War.*—When Lord Dunmore was royal governor of Virginia in 1774, dissension as to boundary lines arose between Virginia and Pennsylvania, as well as to ways and means of dealing with Indians. Virginia wished to possess their lands; Pennsylvania desired their trade; as whites encroached more and more on lands, Indians became angered; outrages followed, perpetrated by Shawnees, Mingos, Cherokees, Wyandots, and Delawares. In the spring of 1774 a ruffian borderer, Greathouse, killed nine kinsmen of the Iroquois Logan. This caused continued hostilities until the battle of Great Kanawha, or battle of Point Pleasant, in October. The effect of this battle kept the northwest Indians submissive during the early years of the Revolution, and at the same time permitted settlement of the Kentucky region.

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COLONIAL WARS — COLONIES AND COLONIZATION

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Colonial Wars, Society of. The Society of Colonial Wars in the State of New York was incorporated 18 Oct. 1892. It is essentially a patriotic organization, keenly alive to the necessity, in these modern days of whirl and rush, of perpetuating the names and valor of those participating in the warfare of American colonial history. Eligibility to membership consists in the applicant being 21 years of age, of good moral standing, and having a line of descent from an ancestor: (1) who served as a military or naval officer, or as a soldier, sailor, or marine, or as privateersman, under authority of the colonies which afterward formed the United States, or in the forces of Great Britain which participated with those of the said colonies in any wars in which the said colonies were engaged, or in which they enrolled men, from the settlement of Jamestown 13 May 1607, to the battle of Lexington 19 April 1775; or (2) who held office in any of the colonies between the dates above mentioned, either as (a) director-general, vice-director-general, or member of the council, in the colony of New Netherlands; (b) governor, lieutenant or deputy governor, lord proprietor, member of the king's or governor's council, in the colonies of New York, New Jersey, Virginia, Pennsylvania, and Delaware; (c) lord proprietor, governor, deputy governor, or a member of the council, in Maryland and the Carolinas; (d) governor, deputy governor, governor's assistant, or commissioner to the United Colonies of New England, or body of assistants in any of the New England colonies.

Membership is hereditary in the male line of the present members of the society and of those who may hereafter be elected, up to the limit that the society may hereafter determine upon, subject to the vote of the council upon the moral qualification of the person who may be the heir at any time to such membership. The membership in the New York Society is limited to 1,000, exclusive of descendants of members, members of State societies who may be transferred to this society, and members of the army and navy and marine corps on active service.

In 1903 there were 26 co-ordinate State societies united in the general society, with a membership approaching 6,000. In New York "business courts" are held in March and November; a "general court," for the annual election of officers, in December. At these courts papers are read dealing with the colonial period. An annual banquet is held in honor of the founding of New Amsterdam. A "general assembly" of the general society meets once in three years at such time and place as the preceding assembly designated. These general assemblies are composed of the members of the general council, together with five delegates chosen by each of the State councils.

The society has erected commemorative bronze tablets at Fort Oswego and Ticonderoga,

and one of marble to Gen. Forbes. An oil portrait of Gen. Bouquet has been presented to the city of Philadelphia, and adorns Independence Hall. Many members of the society participated actively, either in the army or the navy, during the Spanish-American war, many thousands of dollars being contributed by the several State societies, from Maine to California, in equipping State regiments, caring for the sick and wounded, and for hospital supplies, flags, band instruments, etc. The year-books of the society contain valuable historical and genealogical data.

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Colonies and Colonization. In the older and stricter sense, a colony is a body of people who, having migrated and settled beyond the borders of their native country, retain a political connection with the parent state. Since, however, the colonists may be mingled in any proportion with the natives, it is impossible to maintain a firm distinction between colony and dependency. It has therefore become customary to apply the term "colony" to an outlying possession of a national state the administration of which is carried on under a system distinct from but subordinate to, the government of the national territory. According as the dominant feature is the exploitation of a dependent population, the settlement of immigrants from the mother country, or the investment of capital, colonies may be divided into possessions, settlement colonies, and investment colonies.

The Greek colony was formed in a natural way by the swarming off of surplus population, and was usually independent from the beginning. The bond between the mother state and the colony was sentimental, not political, and the former seldom expected any advantage from the founding of the colony save relief from the pressure of population. The Roman colonies formed part of an elaborate scheme for extending Roman dominion. They were instituted by the state, and were its chief instrument in confirming its conquests. In their origin they were little more than garrisons in conquered, fortified places, where land was allotted to the soldiers instead of pay and provisions.

When the discovery of America occurred, Europe was not overpeopled, and there was for a long time little spontaneous outflow of substantial elements to create new communities. The conquest of large and industrious populations, settled upon rich lands, tempted the cupidity of rulers, and gave rise to the conception of the colony as a possession, an estate to be mined or worked by the state or its favorites for purposes of revenue. Says Seeley: "A native population reduced to serfdom, in some parts driven to compulsory labor by caciques turned into state officials, in other parts exterminated by overwork and then replaced by negroes; an imperious mother country drawing from the colony a steady revenue and ruling it through an artful mechanism of division, by which the settlers were held in check by the priesthood, and by a serf population treated paternally, that it might be available for that purpose; such was the typical colonial system."

The exploitation of subject populations by such means as tribute, serfdom, forced labor on public works and government plantations, or

COLONIES AND COLONIZATION

the maintenance of crown or company monopolies, has come to be generally recognized as short-sighted, and no longer commends itself to enlightened nations. The old, harsh policy has, moreover, become more difficult with every step toward popular government in the dominant country, and every increase in the power of public opinion. The idea that the dependency is an estate, to be worked for the benefit of the owner, is, however, by no means dead. A disguised and slanting exploitation is still effected by tariff discriminations which insure the dominant country a monopoly of colonial trade, by the granting to favored citizens of lucrative concessions and contracts, by the imposition of a highly paid civil service from which the natives are excluded, and by the saddling of colonial taxes upon the natives while the proceeds are expended in the neighborhood and for the benefit of the European settlements.

Entirely different from the type just described is the settlement colony, which grows up in desirable temperate regions, vacant or sparsely peopled by savages. Although the love of adventure, the crusading spirit, and the desire to escape political, religious, or racial oppression are by no means to be overlooked, it is chiefly the economic motive that leads to the founding of settlement colonies. A stationary population enjoying rapid industrial expansion yields few colonists, but a clogged labor market, a narrowing circle of opportunities, and a darkening prospect stimulate large numbers to face the unknown in the hope of bettering their condition. Not only is a population stimulated to its utmost capacity, provided it remains in vitalizing touch with the mother country, but the mixture of races results frequently in a beneficial crossing of stocks, and the severe struggle in a new and untamed environment accelerates the improvement of the race by natural selection. The growth of numbers, changing constantly the relation between population and opportunities, carries a colony through well-defined stages. First comes the appropriation of natural wealth, hunting, trapping, and mining; then follows pastoralism; then agriculture, to which in time is added manufacturing. During the earlier stages, when the colony is complementary to the mother country, each finds in the other a convenient vent for its surplus products. The volume of exchanges is relatively large, and their trade reaches its maximum importance. But as population thickens and wealth accumulates, the colony, acquiring home manufactures and home markets, becomes an integral, self-sufficing community, and evinces a growing disposition to assert its independence of the mother country, formerly its complement, but now its competitor.

The granting of large entailed estates may lend a colony a semi-feudal character. But if the land system is popular, landed property will be diffused, the proceeds of labor will go to the producer, and the colony will contain few persons living on incomes derived exclusively from ownership. Moreover, being more favorable to production than to consumption, the colony will draw to itself adult males from the industrial population of the mother country, but will attract few members of the less active classes. Since the reward of industry is greater than in older societies, and the community is but little differentiated, economically or socially.

manhood rather than property controls the body politic, the temper is individualistic and liberty-loving, and the conditions favor the germination and rootage of democratic ideas. Despite its social and political radicalism, the colonial society is conservative in its moral and religious ideals. Unless non-economic motives have presided over the beginnings of the colony, the pursuit of wealth is the chief interest of the settlers, and there is little room for speculative thought. The lack of cities, of intercourse, and of leisure is unfavorable to the cultivation of the sciences or the fine arts. During the early life of the colony the preoccupation with private affairs leaves little margin for public life. If the mother country is wise enough to establish security without interfering vexatiously with private interests, the administration of affairs of general concern is turned over to it without regret. A dependence upon the richer and riper culture of the parent state may indeed cause the political connection to continue long after the colony is ready for self-government. Lands thickly peopled by non-European races, and tropical regions where the climate is such that white men will not settle there with their families, do not develop into settlement colonies. Unfit to serve as an outlet for the surplus population of the temperate zone, they can be legitimately utilized by the more advanced races only as a field for the employment of commercial or industrial capital.

The commercial type of the investment colony is best seen in the early establishments of Portugal, Holland, and England, for trade with the East Indian and African peoples. When colonial enterprise is dominated by the commercial motive, penetration of the interior of a new region is not required. Trade is conducted from the decks of merchantmen, from hulks anchored at the mouth of streams, or from fortified stations situated on the seacoast or on the banks of navigable rivers. Settlements of traders and soldiers spring up, but there is little motive to extend political control over large inland regions. A chartered commercial company has at first no occasion to clash with the natives. Its armament is chiefly directed against envious rivals, eager to share in its lucrative trade. Later, when in its eagerness for an exorbitant profit, it attempts to dictate to the natives or limit their production of the staples of trade, it comes to blows with them, and squanders its resources in profitless wars. The earlier commercial colony was valued as a source of tropical products, such as sugar, coffee, and spices, which could be resold in Europe at a large advance. Since the advent of machine industry, however, the commercial colony is valued rather as a market for surplus manufactures. The recent revival of protective tariffs accentuates the struggle for outlets, and impels each of the industrial countries to extend, so far as possible, its control over Oriental and tropical populations, in order to develop in them a taste for its own goods and thus build up an important trade. The old maxim that "trade follows the flag" has taken on a new significance since protectionist nations have adopted the policy of extending their own tariff walls about their territorial acquisitions so as to exclude their commercial rivals.

The chief means of relieving the superabundance of capital that threatens to lower the rate

COLONIES AND COLONIZATION

of profits in the advanced countries is the application of capital in the industrial development of the more backward regions. Tropical lands under native systems are almost invariably under-exploited from the point of view of modern industry. The forest and mineral wealth is largely untouched, and even the area under intensive native cultivation, lacking as it does the best facilities for irrigation, tillage, and transportation, produces by no means the value it might yield. Owing to ignorance, to unstable conditions, or to the lack of accumulated wealth, industry is almost wholly deprived of the aid given by large applications of capital. Under these circumstances it is possible for the more civilized peoples, without in any way exploiting the native populations, without depriving them of their earnings or their patrimony, to apply capital and directive skill in such a manner as to reap a generous profit.

The example of Mexico and of certain countries of South America shows that backward regions may be developed by capital invested under the protection of local governments, and that no adequate reason exists for administering these countries from a distance. In other cases, however, a rapacious and unstable native rule paralyzes industry, and the utilization of natural resources is impossible until a responsible and equitable government has been instituted. It is necessary for some civilized power to suppress tribal and local warfare, to stamp out brigandage, and to establish an efficient police, a righteous administration of justice, and a rational system of taxation. When order and stability have thus been assured, the next step is the investment of development capital in the form of harbors, railways, highways, telegraphs, improved natural waterways, and irrigation works. As the means of communication are perfected, there follows naturally the employment of capital in the opening of mines, the cutting of forests, the clearing and planting of estates, and, possibly, the establishment of factories. The development of a tropical region by the aid of capital from abroad requires the presence of a small body of white men in the capacity of officials, traders, planters, and superintendents, representing in the midst of the less advanced population the superior power and intelligence of the civilized peoples.

The extension of modern forms of agricultural exploitation into climates where white men cannot endure heavy field-work creates special problems respecting the relations of capital and labor. Successful enterprise requires an abundant supply of suitable and reliable labor, and this can come only from the natives or from other colored races. In the old plantation colony the problem was solved by enslaving the local population, or by kidnapping negroes from Africa. Of late there is a tendency, in case the natives cannot be tempted or taxed to work, to draw upon the great reservoir of labor power in the East Indies and China. In the British colonies alone the numbers of coolies that have been imported under five-year contracts are approximately: In Guiana, 70,000; Trinidad, 70,000; Natal, 40,000; Jamaica, 13,000; Mauritius, 250,000. Owing partly to the racial inequality of employer and employee, and partly to the character of tropical agriculture, which cannot bear interruption, especially at harvest time, there is a strong tendency in all planting

colonies to compel the specific performance of the labor contract. Under the indentured labor system in the British colonies strikes are unlawful, and refusal to work can be punished; on the other hand, the government closely supervises the terms of the labor contract, suppresses all obnoxious features, and provides machinery for compelling the fulfilment of its provisions by the employer.

If the welfare of the colony is the first desideratum, the degree of control exercised by the mother country over the internal affairs of a settlement colony will be moderate at the beginning, and will tend constantly to diminish. The prosperity of the English colonies in America was largely due to the salutary neglect of the mother country. They revolted when she sought by a stricter control to make them subserve her economic interests. The home government, even with the best of intentions, is likely through sheer ignorance to press upon the colony institutions ill-adapted to local conditions. On the other hand, during the early life of the colony the settlers, preoccupied with private affairs, have little leisure for the study of the problems of administration and government. Their political life is unduly dominated by selfish, special interests, and there is danger that the first comers may monopolize or waste the natural wealth which ought to be reserved for later arrivals. As impartial umpire and as custodian of the interests of the future, the home government may wisely exercise a supervision which will diminish as the colonial society grows in mass, stability, and variety of interests. In the final stage of political connection, the colony is granted autonomy in all save external affairs, or even becomes with the mother state a member in a federal empire. On the other hand, this gradual ripening off the parent stem is by no means the normal course of a tropical colony, where there are two unmingling elements in the population—a colored race and an incoming European race. In the West Indies, for example, self-government means the rule of the one race or the other. There is either the domination of a large native population by a permanently resident European caste, cut off from the moral and political conditions which have produced European standards, or else the subjection of the white element to the uneducated and politically inefficient majority race. Here, the home government presents itself as a power superior to local prejudices and able to override the antagonistic class or race interests which otherwise might wreck the prosperity of the colony. For these reasons the system of self-government now enjoyed by the colonies of Canada and Australasia is not likely soon to be extended to the remaining 500,000,000 human beings in existing colonies, dependencies, and protectorates.

The method of direct administration—known as “the crown colony system”—while excellent as a means of balancing conflicting interests and protecting the native majority against oppression by the white minority, errs in trusting too much to the power of ordinance, and showing too little deference to the deeply ingrained customs and characteristics of the native population. The direct government of an alien race by European officials is, moreover, very expensive; and if it is sought to utilize natives as magistrates and police, the best among the

COLONIZATION SOCIETY OF AMERICA

native leaders will stand aloof, leaving often only the ruffraff to become the instruments of administration. Provided there exists an advanced civilization and a highly organized native society, the legitimate ends of European control over a tropical region can best be attained by preserving and working upon the native government through the instrumentality of a protectorate. By this method the natives continue to follow their natural leaders, and retain their time-hallowed laws and customs. Resident agents of the suzerain country supervise the native authorities and, by the exercise of personal influence, prevent misrule, suppress obnoxious practices, and introduce gradually the standards of civilized administration. Commercial and industrial development proceeds apace, while the local population is better safeguarded against exploitation.

The present age has seen a marked increase of political dependency. The strong nations evince a growing disposition to police and place under orderly administration all regions where potential wealth exists, in order to make safe and profitable the improvement of such re-

The table below prepared by the Bureau of Statistics of the United States Treasury Department shows the present area and population of the colonial possessions, protectorates, dependencies, and "spheres of influence" of each country given.

Colonization Society of America, The National, an association to colonize free negroes in Africa or elsewhere. The idea was evolved by friends of negro advancement and opponents of slavery; by Dr. Samuel Hopkins of Newport, R. I., in 1770, at once to Christianize and civilize Africa, and to assist emancipation here by providing a place to which free negroes could go; and by Jefferson during the Revolution, for the latter object. But about 1800 it was taken up by the slaveholding interest, for exactly the opposite purpose—to strengthen their system by deporting the free negroes, who made the slaves discontented and were considered otherwise objectionable. Virginia tried repeatedly to obtain a national grant for colonizing purposes, and failing this, in 1806 enacted that any slave thereafter freed should leave the State within a year or be again reduced to

COUNTRIES HAVING COLONIAL OR NONCONTIGUOUS TERRITORY	Number of colonies, etc.	AREA		POPULATION	
		Mother country	Colonies, and other noncontiguous territory	Mother country	Colonies, and other noncontiguous territory
		<i>Square miles</i>	<i>Square miles</i>		
United Kingdom.....	54	120,979	*12,043,806	41,605,177	*351,254,076
France	29	204,092	4,317,826	38,595,000	62,270,560
Netherlands	8	12,648	782,863	5,103,924	33,408,014
Belgium	1	11,373	900,000	6,744,532	30,000,000
Chinese Empire.....	5	1,353,350	2,881,560	383,000,000	16,680,000
Germany	12	208,830	1,027,370	56,345,014	14,679,100
Turkey	5	1,115,046	840,486	24,931,600	14,701,221
United States.....	6	3,025,600	729,272	75,693,734	9,185,636
Portugal	10	34,528	804,004	5,049,729	10,115,804
Japan	2	147,655	13,543	43,760,754	2,797,400
Russia	3	8,660,395	114,320	128,932,173	3,300,000
Austria-Hungary	1	240,952	23,262	45,310,531	1,568,092
Italy	2	110,646	142,000	32,449,754	729,516
Spain	4	197,670	246,698	18,089,500	475,611
Denmark	4	15,289	87,148	2,447,441	127,184
Total	146	15,459,053	24,954,158	908,058,863	551,292,214

*Includes feudatory states of India, whose area is 731,944 square miles; population, in 1901, 63,181,000.

sources by means of the capital and skill of their citizens. The investment motive is likely to become in the future even more imperious than now, and the increasing speed of communication favors the permanence of the colonial relation where once it is established. There is, in fact, every prospect that in the more advanced nations a larger and larger share of attention will be given to colonial affairs and problems.

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slavery; and in 1816 the petition to Congress was renewed, to force some national action. On the first of January the society above was organized. The president (Judge Bushrod Washington), all the managers, and all but a small minority of the vice-presidents, were slaveholders; its constitution professed no purpose to benefit the blacks, and its ablest northern advocate denied that it had any. Support was asked for it in the North on the ground of its civilizing Africa and leading to gradual emancipation; in the South, on the ground of its contributing to the continuance and strengthening of slavery, augmenting the value of slave property, and providing an overflow for the excess of slaves beyond profitable employment. This impossible "straddle" of purposes ruined its chance of accomplishing much; though a number of the best northern philanthropists, and their southern peers like Birney, clung to it for some years and hoped for good from it. A great many State branches were organized, and vigorous public appeals made for it. Charles Carroll, James Madison, Henry Clay, and Latrobe the architect were its presidents. In 1820 a colony of a few hundreds was sent to Sherbro Island, West Africa, with tools and arms, and in 1822 another was sent to

COLONNA — COLONNA PALACE

found Liberia, with sincere hopes. But the perpetual vilification of the free negroes by the managers, advocates, and organs of the society, their anxiety to do nothing to antagonize the slaveholders, and their advocacy of the severest "black laws" to force the freedmen into desiring deportation as a refuge, alienated the anti-slavery element, who felt that they were being used as cats'-paws of the slave interest. Even Daniel Webster in 1825 refused to join it on that ground, though in 1822 he favored it. By 1830 the Tappans, Gerrit Smith, Birney, Lundy, Garrison, and others had withdrawn from it, and the last-named was openly denouncing it. In 1833 he went to England to expose it before the anti-slavery people there, and they united in a public protest against it. A similar society was organized there, but accomplished nothing. The American society maintained its organization even after the War, though its problem was altered, as well as the southern attitude toward it. An effort a few years since to promote a large negro emigration to Kansas or Oklahoma was met with strong objection from southern employers of labor. Consult: Wilson, 'Rise and Fall of the Slave Power in America,' Vol. I., chap. 15; Alexander, 'History of Colonization on the West Coast of Africa.'

Colonna, kō-lōn'nā, Aegidius de, Italian scholastic theologian: b. 1247; d. 1316. He was prior-general of the Augustine order, and an ardent realist and disciple of St. Thomas Aquinas, under whom he studied at Paris.

Colonna, Fabio, Italian botanist: b. Naples 1567; d. there about 1650. He published several botanical works and is classed as the founder of genera in botany.

Colonna, Fabrizio, fä-brēt'sē-ō, Italian general: d. Naples 1520. He was the cousin of Prospero Colonna (q.v.) and father of Vittoria, served in the army of Charles VII. of France in 1494; in that of Frederick, king of Naples, in 1497; and afterward in that of Ferdinand the Catholic, by whom he was made grand constable in 1507. Subsequently he served in the papal army under Julius II. In 1512 he was made prisoner at the battle of Ravenna by Alfonso d'Este, Duke of Ferrara, who treated him with distinction, and dismissed him without ransom. To show his gratitude he tried to reconcile Alfonso with the Pope, and gave him a safe conduct to come to Rome; but Julius kept him prisoner, and attacked his states. Colonna, indignant at this breach of faith, rescued Alfonso from the papal troops, and reconducted him to Ferrara.

Colonna, Marco Antonio, Italian commander: b. 1535; d. 1 Aug. 1584. He commanded the papal forces at the battle of Lepanto and was subsequently viceroy of Sicily.

Colonna, Ottone. See MARTIN V. POPE.

Colonna, Pompeo, pōm-pā'ō, Italian ecclesiastic, nephew of Prospero Colonna (q.v.): d. 1532. He was a restless and intriguing Roman cardinal who quarreled in succession with the Popes Julius II., Leo X., and Clement VII., and had part in all the troubles of the court of Rome. When Clement VII. was the prisoner of the Constable de Bourbon, Pompeo exerted his influence for his liberation. He at length became viceroy of Naples.

Colonna, Prospero, Italian general: b. 1452; d. 1523. On the invasion of Italy by Charles VIII. he took part with that prince, owing to his enmity against the Orsini family. He shortly afterward, however, abandoned the French cause, and bore arms in the Spanish interest. Among his most noted victories were those gained at Vicenza over the Venetians 1513; and at Bicoque over the French 1522. He also took Milan from the French in 1521, and Genoa in 1522. In 1523 he defended Milan successfully against Admiral Bonnivert.

Colonna, Stefano, Italian noble: d. 1347. He deserted the policy of his house, and became a supporter of the Guelf party. He was chosen a senator with Orsini, the hereditary enemy of his family. He was a leader of the nobles in opposition to Rienzi, to whose government he temporarily submitted, but was killed in an attempt to take the city by a *coup-de-main*.

Colonna, Vittoria, Italian poet: b. Marino 1490; d. Rome 25 Feb. 1547. She was the daughter of Fabrizio Colonna (q.v.), and when four years old was betrothed to a boy of the same age, Fernando d'Avalos, son of the Marchese di Pescara. At 17 they were married. After her husband's death in the battle of Pavia (1525), Vittoria found her chief consolation in solitude, and the cultivation of her poetical genius. For seven years she resided at Naples and Ischia, then removed to the convent of Orvieto and afterward to that of Viterbo. In her later years she left the convent and resided in Rome. Her earlier poems were chiefly devoted to the memory of her husband. Among her later verse the 'Rime Spirituali' (1548), is remarkable for truth of sentiment and enlightened piety. She was the friend of Michaelangelo, who wrote several poems to her. Consult Campori, 'Vittoria Colonna' (1878); Ramont, 'Vittoria Colonna, Leben Dichten, Glauhen in 16 Jahrhunderten' (1881); Mrs. Roscoe, 'Vittoria Colonna, Her Life and Poems' (1868).

Colonna, a village in the papal states, which gave its name to one of the most powerful and celebrated aristocratic Roman families. During the Middle Ages the family played an important part in the affairs of Europe, became allied to the greatest houses of Italy, Spain, and Germany, and furnished many celebrated warriors, Popes, and cardinals.

Colonna, Cape. See SUNIUM.

Colonna Palace (It. *palazzo Colonna*), a handsome and interesting structure at the foot of the Quirinal, belonging to the family from whom it is named, but occupied of late years by the French embassy. It was commenced by Pope Martin V. in the 15th century, and was the residence of Julius II. and of Cardinal Borromeo. It contains a picture gallery, open to the public every day except holidays, which in point of size and architecture ranks with the finest in Rome. The ceiling of the great hall, supported by handsome columns of *giallo antico*, is covered with frescoes illustrative of the history of the Colonnas, the central subject being the battle of Lepanto. The collection of paintings, formerly numbering 1,362 pieces, has been greatly reduced by division among branches of the family, but still embraces many magnificent works by Titian, Guido, Salvator Rosa, Guercino, Paul Veronese, Giulio Romano, Holbein, and lesser artists. Almost equally celebrated as the

COLONNADE — COLONY

picture gallery are the Colonna gardens, which extend behind the palace in terraces up the west slope of the Quirinal. They are planted with box, ilex, laurel, etc., and have long rows of straw houses in which the lemon is brought to rich perfection. There are some colossal ruins in the garden, supposed to belong to the temple of the sun erected by Aurelian, and to the baths of Constantine.

Colonnade, a range of columns. If the columns are four in number it is tetrastyle; if six in number, hexastyle; when there are eight, octastyle; when ten, decastyle, and so on according to the Greek numerals. When a colonnade is in front of a building it is called a portico; when surrounding a building, a peristyle; and when double or more, polystyle. The colonnade is, moreover, designated according to the nature of the intercolumniations introduced as follows: pycnostyle, when the space between the columns is one diameter and a half of the column; systyle, when it is of two diameters; eustyle, when of two diameters and a quarter; diastyle, when three; and aræostyle, when four or more. A colonnade differs from an arcade in this respect, that the columns of the former support straight architraves instead of arches.

Colonsay (kōl'ōn sā) and **Oronsay**, ō'rōn-sā, two islands off the west coast of Argyle, Scotland, united at low water, and at high water only about 100 yards apart; united length about 12 miles; breadth varying from 1 to 3 miles. Colonsay is much the larger, and has a diversified surface with fine rock and other scenery and beautiful sandy beaches. On Oronsay are the imposing ruins of an extensive priory, and near it a fine sculptured cross. Cattle and sheep are reared, and fishing is carried on. Visitors land at Scalasaig pier, on the island of Colonsay. The islands are named after St. Columba and St. Oran. Pop. in 1891, 381.

Colonus, in civil law, a freeman of inferior rank, corresponding with the Saxon *ceorl* and the German rural slaves. It has been held probable that many of the ceorls were descended from the *coloni* taken into Saxony by the Romans. The names of the *coloni* and their families were all recorded in the archives of the colony or district, from which fact they were known as *adscriptitii* also.

Colonus, kō-lō'nūs, an eminence near Athens, to which Œdipus retired during his banishment to Thebes, and from which Sophocles gave the title of "*Œdipus Coloneus*" to one of his finest tragedies. According to Pollux, there were two places at Athens known as Equestris and Agoræus Colonus.

Colony, a settlement formed in one country by the inhabitants of another. Colonies may either be formed in dependence on the mother country or in independence. In the latter case the name of colony is retained only in a historical sense. The motives which lead to the formation of colonies, and the manner of their formation, are various. The lust of territory; the requirements of commerce; the desire of increasing wealth, combined with the love of adventure; the necessity of relieving the pressure of redundant population; political dissensions; the convenience of removing to a distance persons likely to disturb the peace of the state, and especially the apparent ease with which a numerous criminal class may be got rid of by

expatriations, are among the chief motives which have influenced colonization. Colonization is only a more formal development of the migratory tendency; and a colony may be considered as an organized and permanent migration. Among ancient nations the principal promoters of colonization in the more formal sense were the Phœnicians, the Greeks, and the Romans, and the greatest colonizers in modern times have been the English and the Spaniards, next to whom may be reckoned the Portuguese, the Dutch, and the French. The Phœnician colonies, extending along the shores and throughout the islands of the Mediterranean, were mainly commercial. The most famous of them was Carthage, itself a great colonizing state. From the distance of the mother states, and the slowness of communication, many of them must have been practically independent from a very early period; but this was not the case with the colonies of Carthage, which wielded powerful armies and maintained great fleets, both for commerce and for conquest. The Greek colonies were widely spread, being numerous in Asia Minor, the Balkan peninsula, and the islands and coasts of the Mediterranean, in South Italy, and Sicily. They were commonly independent, and frequently soon surpassed the mother states in power and importance. Constantinople, Naples, Palermo, and Marseilles were all originally Greek colonies. The Greek civilization was largely based upon and highly favorable to individual liberty, and the independence of spirit which it fostered made political dissension a frequent cause of colonization. A still more pressing one was the limited extent of the Greek territories, and the inviting character of those by which they were surrounded. Rome was a state which left nothing to the individual. Its colonies were chiefly military, and while the empire lasted were all in strict subordination. As the Roman power declined the remains of them amalgamated with the peoples among whom they were placed, and contributed largely to the homogeneous growth of modern civilization.

Before America and the way by sea to the East Indies were discovered, the states of Europe in the Middle Ages, with the exception of the Genoese and the Venetians, had no foreign colonies. The intercourse and wars of the Portuguese with the Moors, then more advanced in civilization than most of the European nations, served to incite their rivalry and stimulate them to maritime enterprise, and they became the pioneers of Europe in maritime discovery. One of the chief names in this connection is that of Henry the Navigator, son of John I. of Portugal. The Portuguese in 1419 discovered Madeira; in 1431-60 the Azores; in 1487 Bartolomeo Diaz doubled the Cape of Good Hope; and on 20 May 1498, Vasco de Gama landed near Calicut on the Malabar coast, after a voyage round the south of Africa. The Moors had previously been in possession of the inland trade of India, and it was not without a struggle that the Portuguese succeeded in establishing settlements on the coast of Malabar. The first Portuguese colonies were garrisons placed along the coasts of the continents and islands they visited for the security of their commerce, as Mozambique, Sofala, and Melinda on the east coast of Africa, Ormuz and Muscat, in the Persian Gulf; Goa, Diu, and Damao, on the Malabar coast of India. Goa became the capital of their Indian do-

COLONY

minions. Colonies were established in Ceylon in 1505; in the Moluccas in 1510; Java, Sumatra, Celebes, and Borneo were also colonized, though the settlements there did not attain so great importance. The direction taken by the Portuguese navigators made them miss the discovery of America; but Brazil was discovered by Cabral in May 1500, a few months after Pinçon, and was colonized by the Portuguese about 1530. The splendid colonial empire of which the foundations were thus laid was not destined to last. As in the case of Spain the energy of the Portuguese was trammelled by climatic and other conditions, and this, together with a despotic colonial policy, had weakened the power of Portugal before she fell in 1580 under the dominion of Spain. The colonial possessions of Portugal were afterward assailed by the Dutch as enemies of the Spaniards, and when she recovered her independence in 1640, many of them were irretrievably lost. Brazil declared its independence in 1822. The colonial possessions of Portugal are now mostly in Africa; the whole of her possessions in that continent embracing an area of more than 5,000,000 square miles.

Soon after the Portuguese the Spaniards commenced the work of colonization. On 12 Oct. 1492, Columbus discovered the island of San Salvador. Hayti, or San Domingo, named by Columbus Española, was discovered in the course of the same voyage, December 1492, and immediately colonized. Porto Rico and Jamaica were colonized in 1509, Cuba in 1511. On the mainland a Spanish settlement was effected in Colombia (New Granada) in 1510. Mexico was conquered 1519-21; Ecuador, Venezuela, New Granada, Peru, and Chile, were occupied and subdued between 1524 and 1541; and Spain was raised to the first rank among the colonizing powers of Europe. The Spaniards regarded their new possessions in various aspects. Some, animated by a zeal for religion, considered the conversion of the natives as the great end which Heaven had assigned to them. Others were inspired by the love of glory or the passion for gain, and scrupled at no means by which it was possible to gratify their wishes. Owing to the degraded character of many of the first colonists, who were often mere adventurers and released criminals, the first settlements suffered much from internal strife and confusion. After many dissensions the government of the colonies, in its fundamental traits, was settled in 1532, during the reign of Charles V. A council of the Indies in Europe, viceroys, at first two, afterward four, together with eight independent captains-general in America, were the heads of the administration. Cities were founded, at first along the coasts, for the sake of commerce and as military posts; afterward also in the interior, especially in the vicinity of the mines; as Vera Cruz, Cumana, Porto Bello, Carthagena, Valencia, Caracas; Acapulco, and Panamá, on the coast of the Pacific; Lima, Concepcion, and Buenos Ayres. The whole ecclesiastical discipline of the mother country was transferred to the colonies, except that in them the Church was much more independent of the king. The intercourse with Spain was confined at first to the single port of Seville, afterward to that of Cadiz, from which two squadrons started annually. So, although commerce was not expressly granted by law to a society, it remained

nevertheless entirely in the hands of a few individuals. Spain took possession of the Philippine Islands in 1564, and a regular intercourse was maintained from 1572 by the South Sea galleons, between Acapulco and Manila; but owing to the great restrictions on commerce those islands, notwithstanding their advantageous situation, were an expense to the crown. Spain proved to be the foremost of the colonizing powers of Europe in respect to the formation of new states; the most unfortunate of all in regard to the retention of her possessions. The causes of the loss of her colonies differed from those which prevailed in the case of the Portuguese. European wars and the decline of her home power were the most important, but they did not so often lead to the colonies falling under other powers, as in the case of Portugal. They more frequently became the occasion of revolt, and the opportunity for declarations of independence on the part of the colonies themselves. Thus were formed the republics of Mexico, of Central America, of Venezuela, New Granada or Colombia, Ecuador, Peru, Bolivia, Chile, etc.; but as the weak government of the mother country served to promote this early defection, few of the states formed in this unfortunate school have yet attained the repose of settled government. An insurrection began in Cuba in 1895, and after Spain had in vain endeavored to suppress it the United States interfered. War followed, with the result that after a brief struggle not only Cuba, but also Porto Rico and the Philippine Islands were lost to Spain.

The Dutch, during the struggle for their independence, first became the formidable rivals of the Portuguese, then subject to the Spanish yoke. They had already for some time carried on the trade in East India merchandise between Lisbon and the rest of Europe, but their intercourse with Lisbon was prohibited by Philip II. in 1584. The prohibition was revived in 1594 with the utmost severity, and a number of Dutch vessels in the harbor were seized. Excluded from the European trade in the productions of India, they resolved to import directly from India the articles which were refused to them in Europe. Companies were formed, which were united into one by a charter granted 20 March 1602 to the Dutch East India Company, established in 1595. This charter, which was renewed afterward at different times, conferred not only the monopoly of the East India trade, but also sovereign powers over the conquests which the company should make, and the colonies which it should establish in India. An entirely new colonial policy was thus introduced, which instead of political or ecclesiastical aggrandizement, contemplated mercantile advantage as its main object. The Dutch colonies in the East Indies were thus commercial colonies; and the islands of the Malay Archipelago, being more easily defended than the continent of India, became the principal seat of the Dutch power. This was undoubtedly the chief cause of their colonies being so long in a flourishing condition, as they required only the dominion of the sea to maintain them. In 1619 the newly built Batavia was made the capital of the Dutch East Indies. About the middle of the 17th century the power of the Dutch reached its highest point. They effected the establishment of a colony at the Cape of Good Hope in 1650, which afforded an

COLONY

excellent bulwark for their East India possessions, and took Ceylon from the Portuguese, after a long and sanguinary struggle in 1658. All the Dutch colonies in the East Indies were under the governor-general of Batavia. In 1621 the Dutch also established a West India Company, which at first made extensive conquests in Brazil, but soon lost them entirely (1623-60). Their settlements on some of the smaller West India Islands, as San Eustatia, Curaçoa, Saba, and San Martin (1632-49), were more permanent. On the continent Surinam, Paramaribo, Essequibo, and Berbice were in the hands of the Dutch in 1667. In North America the Netherlands held the valley of the Hudson, and pushed south at the expense of the Swedes, winning the present States of New Jersey and Delaware, only to lose them to England. The decline of the Dutch colonial power, partly caused by European wars and partly by the successful rivalry of the English, continued from the end of the 17th century till the French Revolution. On the recovery of its independence, the commerce and the colonial importance of Holland somewhat revived, and though many of her colonies were lost, the value of the remainder was enhanced by improved administration. The Dutch still possess numerous colonial possessions in the East Indies, including Java, Sumatra, parts of Borneo, the Moluccas, and part of New Guinea; several small islands in the West Indies, and Surinam.

No colonizing power has had a career of such uniform prosperity as Great Britain. The freedom of her institutions, and the practical enterprise and self-reliance of her people peculiarly fitted her for the work of colonization, and it has steadily advanced with her equally in peace and in war. Her insular situation freeing her from the ambition of direct territorial aggrandizement, and giving her the command of the seas, enabled her in every war to strip her opponents of colonial possessions which were not unfrequently retained as the price of peace. The only break in a career of prosperity which has resulted in the formation of an empire greater in extent of territory and of population than any other known to history was the revolt of her American colonies, which resulted in the formation of a state destined ultimately to rival Great Britain herself in political and commercial importance and in the freedom of its institutions. This state, too, by the successful result of the war of 1898 with Spain, itself entered on a policy of colonial expansion.

The English made their appearance as a colonial power nearly at the same time with the Dutch, but at first with far inferior success. After many fruitless attempts to find a northeast or northwest passage to the East Indies, English vessels found their way round the Cape of Good Hope to the East Indies in 1591. In 1600 Elizabeth granted a charter to the East India Company. Its commerce with India, however, was not at first important. It established only single factories on the continent, and at the beginning of the 18th century the possessions of the English in the East were limited almost exclusively to Madras, Calcutta, and Bencoolen. The ruin of the Mogul empire in India, which commenced in internal disturbances after the death of Aurengzebe (1707), and was completed by the incursions of Nadir Shah (1739),

afforded the opportunity for the growth of British power, as the British and French were compelled to interfere in the contentions of the native princes and governors. The French, under Labourdonnaye and Dupleix, appeared at first likely to maintain the superiority; but the British succeeded in acquiring the ascendancy in the Carnatic; and in the middle of the 18th century they greatly extended their dominions under Clive. By the destruction of Pondicherry they secured their superiority on the coast of Coromandel; and the victory of Clive at Plassey, 26 June 1756, laid the foundation of their exclusive sovereignty in India. By the Treaty of Allahabad, 12 Aug. 1765, Bengal was surrendered to the British by the titular Great Mogul; and the fall of the empire of Mysore, the dominions of Hyder Ali and Tippoo Saib, may be considered as completely establishing the British supremacy in India. The Mahrattas, with whom the British waged war at intervals from 1774 to 1818, and the Sikhs, subdued in 1849, were the last formidable enemies of the company. With the exception of a few dependent states the British territory now embraced nearly the whole of India, and this vast territory was still under the government of a chartered mercantile company, exercising many of the most important functions of an independent sovereignty. On the suppression of the Indian mutiny (1857-8) this state of things was deemed too hazardous to last, and the government of India was transferred to the crown by act of Parliament in 1858. Ceylon was first occupied in 1795-6.

The discoveries of the Cabots, following soon after the voyages of Columbus, gave the English crown a claim to North America, which in the reign of Elizabeth led to colonization on a large scale. In 1606 James I. divided the territory claimed by England into two parts — South Virginia, extending from Cape Fear to the Potomac; and North Virginia, from the mouth of the Hudson to Newfoundland. Two companies were formed for the colonization of America — the London Company, to which was granted South Virginia; and the Plymouth Company, to which was granted North Virginia. The region between the Potomac and the Hudson was neutral ground. The London Company in 1607 founded the commonwealth of Virginia by building Jamestown on the James River, so called in honor of the king. A House of Burgesses for the new colony met for the first time on 19 June 1619, and thus was constituted the beginning of representative government in the British colonies of America. In 1614 Capt. John Smith, having examined the coast from the Penobscot to Cape Cod, named the country here New England. The next permanent settlement on the North American coast was effected in this district by the body of Puritans, known as the Pilgrim Fathers, who sailed from England 6 Sept. 1620, in the Mayflower, and arrived 9 November in Massachusetts Bay. The government of this colony was that of a religious oligarchy. Another colony was established in New Hampshire in 1623, and in the same year Maine, which had previously been colonized by the French, received its first permanent English settlement. New Jersey was colonized in 1634. Connecticut was colonized in 1635 by emigrants from Massachusetts. Rhode Island was settled in 1636. Samuel Champlain, the French navi-

COLONY

gator, was the first European who entered the region now forming the State of New York (1609). In the same year Henry Hudson, an Englishman in the service of the Dutch East India Company, discovered the river to which his name has been given, where Dutch settlements were effected and gradually spread. The English, who claimed this territory as included in Cabot's discoveries, finally seized the Dutch colony of New Amsterdam by force in 1664, giving it the name of New York in honor of James, Duke of York (James II.), to whom Charles II. had made a grant of the province. In 1681 the territory west of the Delaware was granted to William Penn, who colonized it with Quakers, and founded Pennsylvania in 1682. The first settlement in Maryland was made in 1631 by a party from Virginia. In 1633 a colony of Roman Catholics arrived here from Great Britain. The country south of Virginia was permanently settled in 1670 by a party of English colonists who landed at Port Royal and afterward removed to Charleston. The colony was called Carolina. Georgia, originally a part of Carolina, was granted by George II., after whom it was named, to a colony from England in 1732.

Colonies were early established in the West India Islands, including Barbados, half of St. Christopher's (1625), and soon after many smaller islands. Yet the West India possessions did not become important as plantations until the sugarcane was introduced into Barbados in 1641 and into Jamaica in 1660. This island had been taken from the Spaniards in 1655. The cultivation of coffee was introduced into the West India Islands in 1732. Newfoundland was taken possession of by the English in 1583, and colonized in 1621 and 1633. Canada was surrendered by France to Great Britain at the Peace of Paris in 1763 (see section on French colonies below). In 1764 began the dispute between Great Britain and its North American colonies, on the question whether the former had the right to impose taxes on the colonies when they were not represented in the British Parliament; and on 19 April 1775 commenced the war which terminated with the acknowledgment of the independence of the 13 provinces. Though the United States thus entered on their independent career, Canada still remains as a great and flourishing British dependency.

Australia was discovered in the beginning of the 17th century. The first Australasian settlements of Great Britain were penal colonies. New South Wales, discovered in 1770, was established as a penal colony in 1788; Tasmania (Van Diemen's Land), discovered by Tasman in 1742, followed in 1803. West Australia, for some time a penal settlement, was founded as a free colony in 1829; Victoria (Port Phillip) was colonized in 1835, and made an independent colony in 1851; South Australia was settled in 1836; Queensland became a separate colony in 1859; New Zealand, discovered by Tasman in 1742, began to be used in connection with the whale fishery about 1790, was settled in 1839, and made a colony in 1840. In 1851 gold was discovered to be plentiful in Victoria. This gave a great impetus to the prosperity of the Australian colonies, and the influx of population it caused has largely contributed to promote their general development. A federal union of the

British colonies in Australia was proclaimed 1 Jan. 1901, with the title of the Commonwealth of Australia. The Fiji Islands became a colony in 1874, and other islands in the Pacific have been acquired since, as well as part of New Guinea and part of Borneo.

The acquisition of the South African colonies dates from the Napoleonic period, the Cape Colony and Mauritius being both secured to Great Britain in 1814. Natal was proclaimed a British colony in 1843. The Guinea Coast settlements date from the 17th century. Extensive spheres of influence have been recently acquired, being partly developed by chartered companies.

In Europe Great Britain has only two possessions of the nature of colonies, acquired for military reasons: Gibraltar in 1704; Malta and Gozo, 1800.

It is estimated that the existing British colonies and dependencies embrace fully one fifth of the land surface of the globe, and a rather larger proportion of its population. The whole of the British colonial possessions have been grouped in about 40 administrative divisions, and they are situated in every quarter of the globe. See GREAT BRITAIN.

According to their governmental relations with the crown the colonies are arranged under three heads: (1) Crown colonies, in which the crown has the entire control of legislation, while the administration is carried on by public officers under the control of the home government; (2) colonies possessing representative institutions, but not responsible government, in which the crown has no more than a veto on legislation, but the home government retains the control of public officers; (3) colonies possessing representative institutions and responsible government, in which the crown has only a veto on legislation, and the home government has no control over any officer except the governor. All colonies are, however, disabled from such acts of independent sovereignty as the initiative in war, alliances, and diplomacy generally.

France was somewhat late of entering fully upon a colonial career, being retarded by internal dissensions and religious wars. Between 1627 and 1636 Pierre Belain d'Esnambuc colonized St. Christopher's, Guadeloupe, and Martinique. Champlain was the pioneer of the French in the exploration of the North American continent, where they soon had considerable possessions, including Canada—in which they had settlements as early as 1604-5, and where Champlain founded Quebec in 1608—and Louisiana, colonized in 1699. Commercial companies were then deemed essential in colonizing, and a West India Company and an East India Company were established by Colbert in 1664. He purchased on several West India Islands, as Martinique, Guadeloupe, St. Lucia, Grenada, and others, settlements already formed by private persons, and sent out colonists in 1664 to Cayenne. But the settlements in part of St. Domingo, by the buccaneers, became of more importance than those effected by the government. The West India Company survived only 10 years. The East India Company, after fruitless attempts to form a colony in Madagascar, founded Pondicherry on the Coromandel coast in 1670. This became the capital of extensive French possessions in the East Indies. The French also acquired the Isle de France (Mauritius) and Bourbon (Réunion), occupied in 1720.

COLOPHON

At the beginning of the 18th century France had attained an important position as a colonial power. In North America her settlements extended from Canada to California, particularly along the Great Lakes and the Mississippi River, embracing many districts which have since become of the highest importance. Nova Scotia (Acadie) and Newfoundland (Terre Neuve), which had been disputed with Great Britain, were then in her possession. Her West India Islands were more flourishing than those of England, and she still had a prosperous career before her in India. The superiority of the fleet of England gave that power a great advantage in colonial contests, and many of the French colonies subsequently fell under the power of Great Britain. The struggle for the supremacy in India, though France was finally unsuccessful, was long and gallantly maintained, and more than once seemed to promise a different issue. The North American colonies were partly lost by conquest and partly suffered to fall into decay. Of the West India possessions several were taken by Great Britain, and finally ceded to her. Canada was finally ceded to England in 1763; Louisiana, after being surrendered to Spain, to prevent it from falling into the hands of the English, was sold by Napoleon to the United States in 1803. At the general pacification of 1815 France recovered some remains of her colonial possessions, and since then she has acquired extensive regions beyond sea, some of them highly valuable. She occupied in 1830 and begun in 1833 to colonize Algeria, a country whose irregular and lawless government had exposed her as well as other European states to frequent annoyance. Tunis, Senegambia, great tracts of the Sahara, Sudan, and Congo regions, the islands of Madagascar and Réunion, are all comprised in France's African possessions, while in Asia she possesses a large portion of the Indo-Chinese peninsula, and in America French Guiana. Some of the French colonies are represented in the National Assembly by members chosen for the purpose.

Denmark established an East India Company in 1618 with a view to enter on the colonial trade; and other companies were afterward formed. In the same year with the formation of the first company, the colony of Tranquebar was founded on the Coromandel coast. Its success was fluctuating, like that of the companies formed to manage it, and at last, in 1845, it was sold to the East India Company. St. Thomas in the West Indies was settled by the Danes in 1672; St. John and some of the smaller islands in the same group (the Virgin Islands) were also occupied by them. The island of Santa Cruz was purchased from France in 1733. The United States tried to buy these islands in 1902. Sweden established an East India Company in 1741. She acquired the island of St. Bartholomew from France in 1785, but restored it in 1878, and has now no colonies.

Germany has recently been making some attempts at establishing colonies in different parts of the world, and in this way acquired considerable tracts in southwest Africa, east Africa, between the Portuguese and British possessions, Camerun, Togo, New Guinea, etc. Italy has also shown the same ambition, and has established a colony on the African side of the Red Sea, between it and Abyssinia, and in Somaliland.

The colonial policy of paternalistic countries as Spain and Portugal naturally differed from that of commercial and industrial nations like England and Holland. In the former the expense and risk of colonizing was borne by the government, who retained direct control over the colonies and their productions; but in the latter the work, being too much for individual enterprise, was entrusted to companies, whose charters conferred on them not only exclusive privileges in regard to trading, but also extensive powers of conquest and administration. In respect to trade a very exclusive and jealous policy long prevailed, but since the adoption of a free-trade policy in Great Britain, the whole trade of her colonies has been thrown open without reserve, as far as the privileges of the mother country are concerned, to the competition of foreign nations. Other countries, while not following her commercial policy entirely, have relaxed more or less the stringency of the regulations affecting their colonial trade. Consult: Leroy-Beaulieu, 'De la colonisation chez les peuples modernes' (Paris, 3d ed. 1887).

Col'ophon, kōl'ō-fōn, an inscription at the "Finis" of a book, giving the printer's name and date and place of printing; in the early days of printing nearly all books had colophons. The printers followed the usage of their predecessors. The copyists, who almost invariably appended to the works they transcribed their own names, often with date and not unusually with some pious ejaculation. Not a few of the early printers adhered to the custom of the pious ejaculation, but usually the fraternity seized the opportunity of the colophon to magnify themselves and their art and in particular their own proficiency in the art. A collection of colophons of books printed in the first half century of typography would make a highly interesting and amusing chapter in the history of the Art Preservative of Arts. Usually they are ludicrous in the extravagant claims the printers make for the unapproachable excellence of their handwork; but some are modest and dignified, while a few are pathetic, showing the hard struggle made by masters of the noble craft for a bare subsistence. It was quite usual to compose the colophons of Latin classic works in heroic or in elegiac verses. Udalricus Gallus, for example—thus does Ulrich Hahn latinize his German name—in the colophon of his Virgil (Rome 1472) makes a pun with his Latin patronymic Gallus and the Latin name for a native of Gaul, which is also Gallus. In Latin, the noun gallus, as in German hahn, means cock. In the four elegiac couplets which constitute his colophon Ulrich apostrophizes the goose, which, by its cries, notified the Romans of the approach of the Gauls: "O Goose, keeper of Jove's Tarpeian abode, why flap your wings? The Gaul (Gallus) has fallen; the avenger is here, Udalricus Gallus; he has shown that there is no further call for your quills; in a day he prints more than is penned in a year." The two German printers, Conrad Schweynheim and Arnold Pannartz, who produced the *editio princeps* of the same poet in 1469, express in the colophon the hope that their artistic work may make amend for their harsh Teutonic names, unknown to the Muses:

Aspera ridebis cognomina teutona; forsā
Mitiget ars musis inscia verba virum;

COLOPHON — COLOR

which names, however, they contrive to squeeze into a Latin hexameter, thus:

Conradus Suueynheim Arnoldus Pannartzque magistri.

How graceful, modest and dignified is the tetrastich appended by the celebrated French printer, Nicolas Jenson, to his edition of Suetonius: I, Nicolas Jenson, a Frenchman, printed this book; who shall deny it to be a work of art? But while you peruse Suetonius do, I pray thee, love the artist's name —

Artificis nomen fac, oro, lector ames.

Posterity has confirmed that printer's estimate of his work, for his typography has ever since been regarded as a standard of elegance. Vindelin of Spire, the elder printed at Venice in 1470, in the colophon of his Virgil, an elegiac octastich celebrating himself and his typography and boldly challenging comparison with the Grecian masters of form:

Laudent ergo alii Polycletos Parrhasiosve
Et quosvis alios id genus artifices —

let others praise the Polycletuses or the Parrhasiuses, and the rest of that class of artists: Vindelin shall have the highest praise of all.

And Adam Rot, another German printer at Venice, in his Virgil (1471) in 12 hexameter verses, challenges Solomon and Hiram and the Sibyl, and Greece with all her sages, and Rome, mighty in arms and equal to the gods, to show forth such an art as he is master of. In a like spirit Bartolomæus of Cremona in a hexastich colophon to Virgil (Venice 1472) augurs for his natal town undying fame, insured to her by this work of her alumnus, which is more enduring than the Athene of Pheidias —

Phidiacum hinc superat Bartholomæus ebur.

But Christopher Valdarf (? Waldorf) is content with styling himself in the colophon of his Virgil (Venice 1471) the glory of Ratisbon, his native town:

Ratisponensis gloria Christophore.

Colophon, an ancient Ionian (Greek) city of Asia Minor situated at a short distance from the coast and about eight miles north of Ephesus. Its inhabitants were removed by Lysimachus after the death of Alexander the Great. Colophon was one of the places that claimed to be the birthplace of Homer. It was the native city of Mimnermus and other poets. Its site was discovered in 1887 by the German explorers, Schuchhardt and Wolters. Proverbially Colophon came to mean "a finishing stroke" because of the many instances in which the city's cavalry carried the day. The word took this proverbial meaning in Latin and was used by early printers as the imprint at the close of a volume; commonly used before the introduction of the title page.

Colophonium. See ROSIN.

Col'ophony, a name formerly used for common rosin (q.v.), but now found only in books.

Coloquintida. See COLOCYNTH.

Color, the impression given to the eye by lights of various rates of vibration. The optic nerves are excited by vibrations of the light-bearing ether when the rapidity of the vibrations

is not greater than or less than two limits, which perhaps vary slightly with different eyes, just as some ears cannot hear intensely shrill sounds or dull sounds that are perceived by others. Every vibration between these limits is recognized as light; its intensity or brightness is observed; but, besides this, the eye is differently affected by light of different times of vibration, in a way that it is not possible to describe. It is to this variation in the sensation that the name color is given. The word color is also applied to the properties of bodies that cause them to emit the light that thus affects our senses.

In considering the subject we must remark in the first place that ordinary white light, the light which comes from an incandescent solid or liquid, consists, as Newton showed by his celebrated experiment of passing it through a triangular glass prism, of a large number of colored lights, which, meeting the eye together, produce the sensation of white light. The colors of the spectrum are usually said to be seven — red, orange, yellow, green, blue, indigo, violet; although in reality there is an enormous if not an infinite number of distinct colors in it. These colors are frequently called the primary colors, and other tints and shades are producible by mixing them; but in a stricter sense the primary colors are three in number, namely, red, green, and violet (or blue). These three colors or kinds of light cannot be resolved into any others, while a yellow ray, for instance, can be resolved into a red and green, or can be produced by the mingling of red and green light, consequently yellow is not now regarded by scientific men as a primary color. Inasmuch, however, as a yellow and a blue pigment will always produce a green when mixed, red, yellow, and blue may still in a sense be regarded as primary. In the scientific sense of the word white and black are not considered colors, a white body reflecting and a black body absorbing all the rays of light without separating them, whereas the colors proper are due to separation of the rays of light by partial absorption and reflection or by refraction. That the colors of the spectrum may be recombined so as to make white light, the following experiment shows. Let a disk be painted as nearly as possible with the primary colors of the spectrum in sectors. If this painted circle be made to whirl rapidly round its centre all the colors will practically be seen simultaneously at each point, owing to the persistence of the impression on the retina of the eye, and the effect will be that the circle will appear white. If the proportions of the colored sectors be altered, or if any of them be cut or covered with white or black paper, various colors or shades of color are producible. If one complete sector be removed, and the wheel whirled round, the color produced is the complementary color to the removed sector. By complementary color is meant the color or colors which, with any color or colors mentioned, together make white; thus any of the primary colors is complementary to the other two, and a secondary color is complementary to the remaining primary.

The color resulting from the mixture of two or more lights is the color which is seen when they fall on the same part of the retina. There are various methods of mixing lights, such as, (1) by combining reflected and transmitted light; (2) by causing two or more spectra to overlap; and (3) by employing a rotating disk

COLOR.

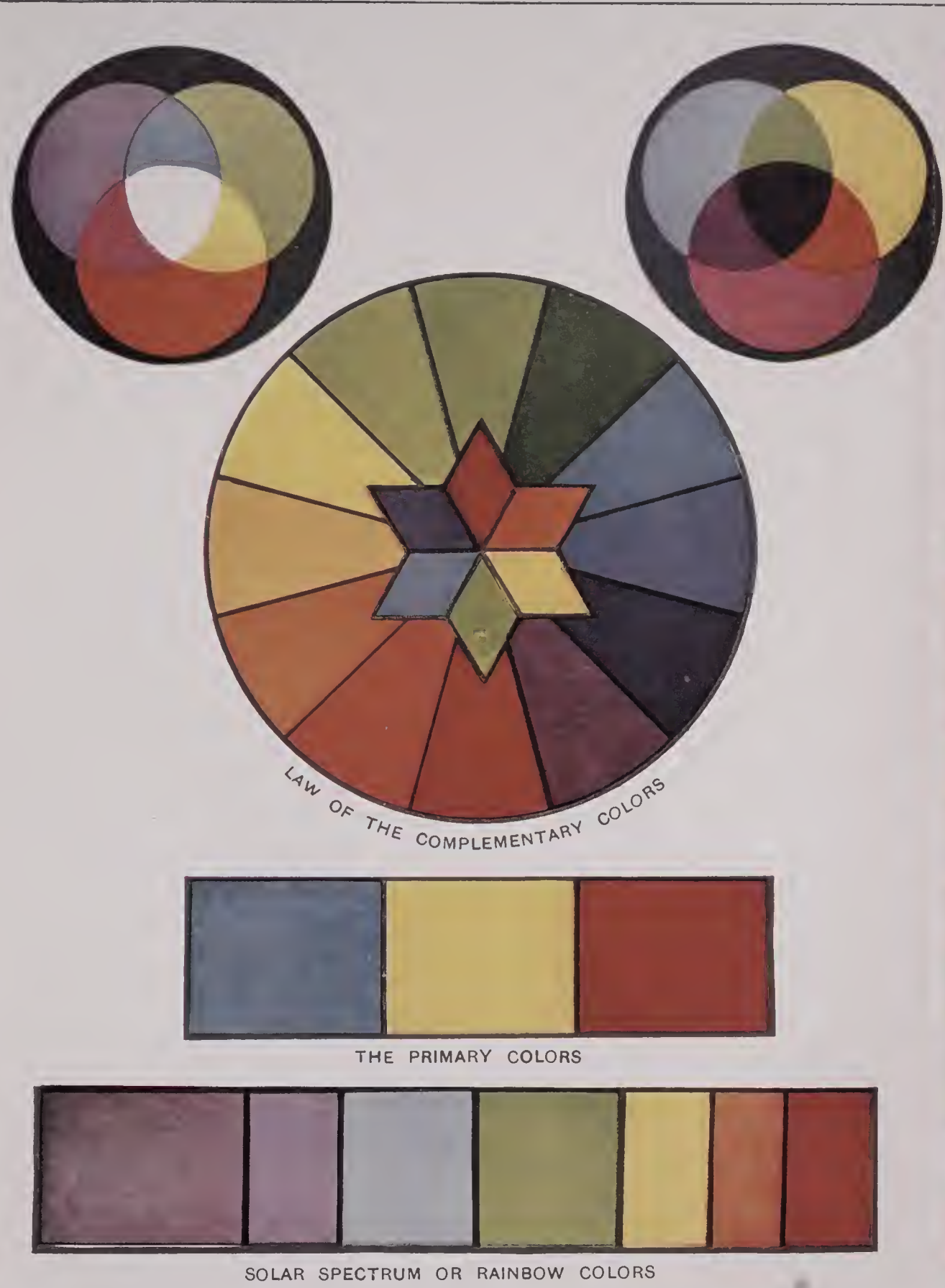


DIAGRAM ILLUSTRATING THE PRIMARY, SOLAR SPECTRUM OR RAINBOW COLORS AND LAW OF THE COMPLEMENTARY COLORS.

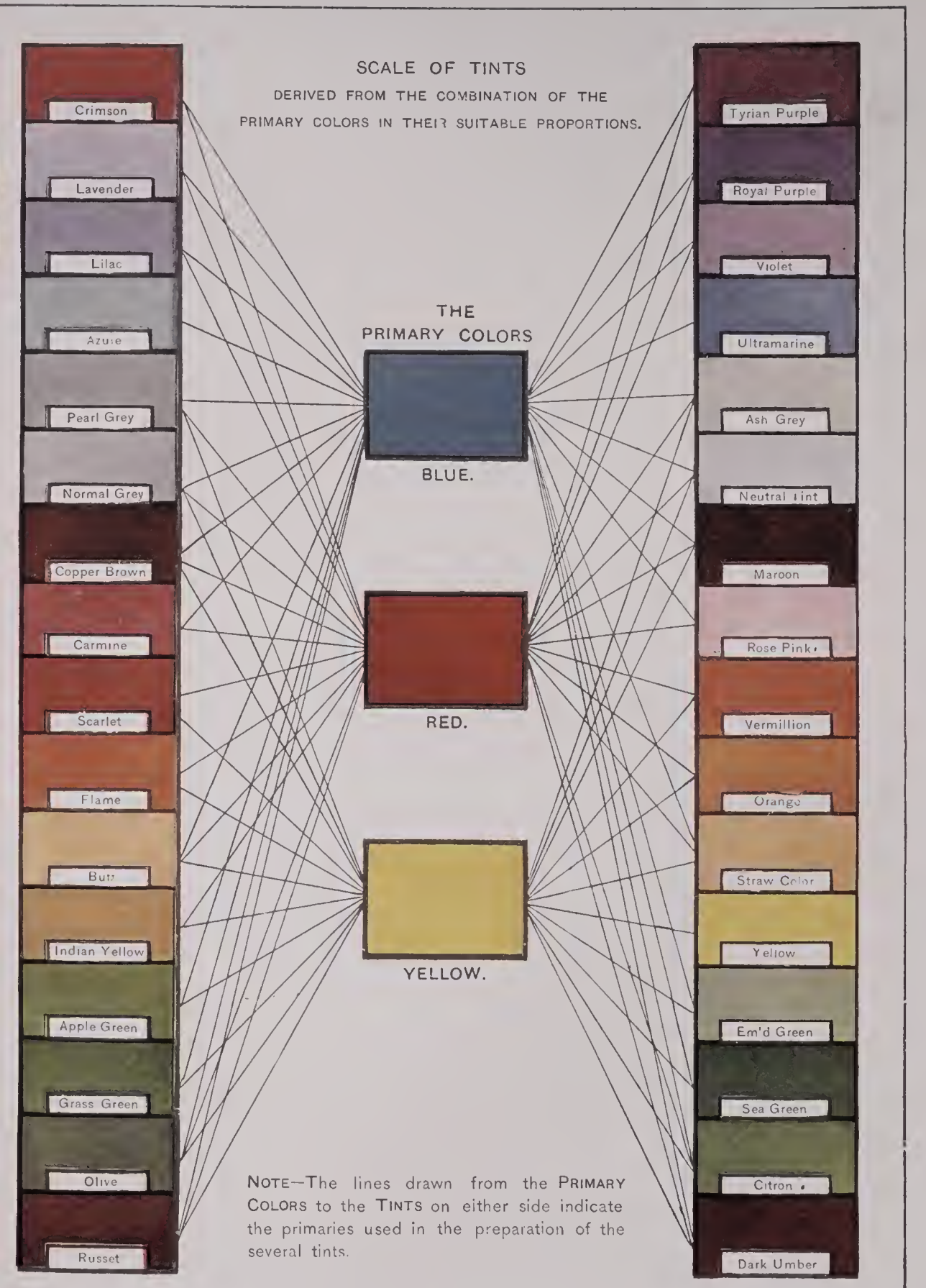


DIAGRAM ILLUSTRATING THE PRIMARY COLORS AND THEIR COMBINATIONS OR TINTS.

COLOR

composed of differently colored sectors, as shown above. Colored disks of paper, each having a radial slit, are very convenient for this purpose, as any moderate number of such disks can be combined, and the sizes of the sectors exhibited can be varied at pleasure. The mixed color obtained by the rotating disk is to be regarded as a mean of the colors of the several sectors,—a mean in which each of these colors is assigned a weight proportional to the size of its sector. Thus if the 360 degrees which compose the entire disk consist of 100° of red paper, 100° of green, and 160° of blue, the intensity of the light received from the red when the disk is rotating will only be $\frac{10}{36}$ of that which would be received from the red sector when seen at rest; and the total effect on the retina is represented by $\frac{10}{36}$ of the intensity of the red, plus $\frac{10}{36}$ of the intensity of the green, plus $\frac{16}{36}$ of the intensity of the blue; so that the resultant color may be called the mean of 10 parts of red, 10 of green, and 16 of blue. All the results of mixing colors can be represented geometrically by means of a cone or pyramid within which all possible colors will have their definite places. The vertex will represent total blackness, or the complete absence of light; and colors situated on the same line passing through the vertex will differ only in intensity of light. Any cross-section of the cone will contain all colors, except so far as intensity is concerned, and the colors residing on its perimeter will be the colors of the spectrum ranged in order, with purple to fill up the interval between violet and red. It would seem that the true form of the cross-section is approximately triangular, with red, green, and violet at the three corners. When all the colors have been assigned their proper places in the cone, a straight line joining any two of them passes through colors which are means of these two; and if two lines are drawn from the vertex to any two colors, the parallelogram constructed on these two lines will have at its farther corner the color which is the sum of these two colors. A certain axial line of the cone will contain white or gray at all points of its length, and is called the line of white. It is convenient to distinguish three qualities of color, which may be called hue, depth, and brightness. Brightness or intensity of light is represented by distance from the vertex of the cone. Depth depends upon angular distance from the line of white, and is the same for all points on the same line through the vertex. Paleness or lightness is the opposite of depth, and is measured by angular nearness to the line of white. Hue or tint is that which is often *par excellence* termed color.

All authorities are now agreed in accepting the doctrine, first propounded by Dr. Thomas Young, that there are three elements of color sensation, or three distinct physiological actions, which by their various combinations produce our various sensations of color. Each is excitable by light of various wave-lengths lying within a wide range, but has a maximum of excitability for a particular wave-length, and is affected only to a slight degree by light of wave-length very different from this. The complete diagram of all color is theoretically a triangular pyramid, having for its three edges the colors which correspond to these wave-lengths; but it is probable that we cannot obtain one of the three elementary color sensations quite free from admixture of the other two, and the edges of the pyramid

are thus practically rounded off. One of these sensations is excited in its greatest purity by the green, another by the extreme red, and a third by the extreme violet. These three actions are ascribed to three distinct sets of nerves, having their terminations in different parts of the thickness of the retina, a supposition which aids in accounting for the approximate achromatism of the eye, for the three sets of nerve terminations may thus be at the proper distances for receiving distinct images of red, green, and violet respectively, the focal length of a lens being shorter for violet than for red. As it is completely established that the difference between the colors of the spectrum is a difference of vibration-frequency, there is an obvious analogy between color and musical pitch. Attempts have been made to compare the successive colors of the spectrum with the notes of the gamut; but forcing is necessary, as in almost all details the relations between colors are strikingly different from the relations between sounds.

When white light falls on the various objects that surround us, it is not always reflected back to our eye as white light. The bodies are illuminated by it, but they have the power of so altering it that they appear to us colored. The reason of the natural colors of bodies is a difficult subject, and one that is scarcely yet understood. It is usual to say that the surfaces of bodies have the power of absorbing certain parts of the white light and reflecting the remainder back, and that what we see is the complementary color to that which is absorbed. This is generally the case with light passing through a transparent colored body. But there is good reason for thinking that this is not really the case always. Experiment, in fact, seems to show that the light which comes from colored bodies is frequently generated by the bodies themselves by a kind of luminous resonance, as it has been called; just as a harp with two or three strings will send out a sound by resonance when a loud noise of any kind is made near to it, but the sound emitted by the harp will be only that belonging to its two or three strings, and not a clash like that which set it in vibration. The subject is one of much difficulty, as we know nothing of the molecular construction of the surfaces of bodies.

Lastly, we have to speak of the colored lights produced by ignited gases. The lights themselves are often far less complicated than white light, though we have spoken of them last. Incandescent gases, instead of giving out white light, as incandescent solids and liquids do, give out light of colors depending on the nature of the gas or vapor. Seen by the eye the flame is colored, and examined by the spectroscope it is found to be in many cases a very simple light indeed. Thus sodium vapor gives a yellow light, and on looking at a flame containing nothing but sodium it is seen to consist of two particular yellow lights shown by two bright yellow lines in its spectrum. Thallium, another metal, gives a simple green light. Hydrogen gas also gives a pale-blue flame when burning, and shows some five or six bright lines. So also do other gases. These colored flames are taken advantage of by the pyrotechnist, who mixes the powder for his fireworks with various bodies which give colored flames. See LIGHT; SPECTRUM.

COLOR-BLINDNESS — COLOR PHOTOGRAPHY

Color-blindness, a singular affection, producing an inability to distinguish one color from another, and in certain rare cases to discern color at all, the eye perceiving only light and shade, or black and white. Almost no attention appears to have been paid to this subject till the end of the 18th century, when the famous chemist, Dr. Dalton, brought it into notice by publishing in 1794 an account of his own case as marked by this peculiarity. More recently, Dr. George Wilson of Edinburgh also examined minutely into this phenomenon, and collected many striking instances. From the result of these investigations it would appear that color-blindness is much more common among men than among women, and that of the former one in 20 is unable to discern the nicer shades of color, and one in 50 to distinguish certain primary colors from one another. The colors most liable to be confounded are red and brown with green, purple and green with blue, red with black, light hues of all sorts with white, and dark shades with black. Many of the instances adduced by Dr. Wilson are exceedingly curious and amusing. An undertaker covered a coffin with bright scarlet instead of black; a chemical lecturer had always to ask the colors of his compounds; a physician never met with scarlet fever in the course of his practice; a gentleman meeting a lady in a green dress condoled with her on the bereavement which he imagined she had sustained; and a quaker purchased a bottle-green coat for himself and a scarlet merino gown for his wife. The cause of this remarkable affection in almost every case which has been carefully investigated has been found to be seated in the sensorium, not in the visual apparatus, and to consist in the absence of the elementary sensation corresponding to red. To persons thus affected, the solar spectrum appears to consist of two decidedly distinct colors, with white or gray at their place of junction. One of these two colors is doubtless nearly identical with the normal sensation of blue or violet. The other color extends a considerable distance into what to normal eyes is the red portion of the spectrum. The scarlet of the spectrum is thus visible to the color-blind, not as scarlet but as a deep dark color, perhaps a kind of dark green, orange and yellow as brighter shades of the same color, while bluish-green appears nearly white. The eyes of persons so constituted present in general nothing abnormal either internally or externally, while their power of vision is equal to, and in many cases even superior to, that of persons in whom no such peculiarity exists. The colors most easily distinguished by the color-blind are yellow and blue, the latter color, if pure and well-illuminated, being the one many of the color-blind see best, and which is rarely mistaken for other colors. The use of yellow spectacles has accordingly proved advantageous in some cases. It is a curious fact that the substitution of artificial light for daylight often enables persons affected in this manner to discern colors.

Color Photography. From the earliest days of photography, efforts have been made to reproduce by it alone the colors of nature. It was found as long ago as 1801 by Ritter, of Jena, that the various rays of the spectrum differed considerably in their action on silver chloride, and in 1810 Seebeck, also of Jena, ob-

tained a reproduction of the spectrum, in some approach to natural colors, on paper coated with silver chloride. These images could not, however, be fixed.

Various other experimenters have from time to time endeavored to obtain the desired result by the use of different materials and methods, but without effecting a complete solution of the problem.

In 1891 Lippman laid the foundation of the process known by his name, it being based on the theory of Zenker and work of Wiener, with due acknowledgment to both. This is distinguished as an "interference" process, the effect being produced by decomposition of the light.

The apparatus employed for the production of the picture is very simple, differing but little from that used for ordinary photography. Any transparent sensitive film answers as the photographic surface. This film is exposed in a camera of the usual type, with the difference in arrangement that the plate is backed by a layer of mercury, which layer, of course, acts as a mirror. The arrangement is effected by using a slide so arranged that mercury can be allowed to flow into a space back of the plate after the plate has been placed in the slide. After exposure the mercury is allowed to flow out, and the plate is then developed in the usual way.

The materials on the finished plate are the same as those on an ordinary negative, but a difference exists in the structure of the deposit, by which it is enabled to decompose the light by which it is illuminated and reflect those portions of it which correspond to the natural colors of the object from which the picture was taken.

The reason for the formation of this structure as formulated by Lippman is that the light waves, as they rush through a plate as ordinarily arranged, impress the plate more or less strongly, and thus leave a design of different intensities of the image, but in this rapid passage they leave no record of their own forms. Each ray of light of a certain color has a certain structure; it is made up of waves which have a certain wave-length. If there be a mirror behind the plate, the light, says Lippman, is reflected back on itself; the light rushes in and rushes out again with the same velocity; the entering and issuing rays interfere, and the effect of the interference is that vibration takes place; but the effects of propagation are stopped, and instead of having propagated waves we get stationary waves; that is, the waves now rise and fall, each in its own place; they pause, therefore, in the interior of the film and impress their form upon it.

On looking through a film obtained by the Lippman method it appears like an ordinary negative; its color effect is obtained only when viewed by reflected light, different portions of the plate reflecting different colors according to the light-waves by which it had been impressed. In order that the interference colors may be seen so that they are true to nature, the plate must be viewed by vertical incidence, which is inconvenient. They may be projected by an arrangement devised for the purpose.

In 1861 Prof. Maxwell showed at a lecture at the Royal Institution that by taking photographs of a colored ribbon through three solutions colored to represent the primary colors, and then projecting these photographs so that their

COLOR PHOTOGRAPHY

images were superposed, a colored image of the ribbon was given, which was faulty, however, from lack of photographic materials more sensitive to the less refrangible rays. In 1873 Prof. Vogel announced that dyes would influence the distribution of color-sensitiveness in plates.

On these facts are based the process of Ives, brought out in 1892. In his process three negatives are obtained through color-filters; from these positive transparencies are made (in monotone), which are placed in a special viewing instrument called the "kromskop," each in combination with its properly adjusted color-screen; these being then combined, the images are seen in the original colors of nature.

The next development in this method was the introduction of the process worked out by Prof. Joly in 1894. This differs considerably from the Ives method in the manner of working, but in principle it is very similar. Only one negative, instead of three, is required, but this is taken through a transparent lined screen, ruled very finely and closely with parallel alternate lines of orange, yellowish-green, and blue. After development a positive transparency is made from the negative, which, when mounted accurately and in close contact with a viewing-screen similarly ruled with parallel lines of red, green, and violet, the image is seen in its original colors. These mounted positives are usually viewed as lantern-slides, but are somewhat marred by the obtusiveness of the lines when seen too closely.

To go back to the underlying principle of the three-color process—the "filtering" out of certain rays in taking the different plates—we should explain that the primary colors from which white light is formed are now set down as a particular shade of red, a particular green, and a particular blue-violet. The primary pigmentary colors, it may be added, are red, yellow, and blue, as has always been taught. If we obtain three negatives from an object, each taken through a color-filter or screen adjusted for the red, the green, and the blue-violet respectively, these plates will present negative images of the object in the negative values of the colors named. When from each of these negatives we produce a positive in the complementary color, and combine these positives in accurate registration, we shall, if the operations have been correctly performed, obtain a reproduction of the original object in the exact colors of nature. The ordinary photographic plate, as is well known, is not sensitive to all the rays. If, however, the addition of certain colored substances, chiefly analine compounds, be made to the emulsion, these apparently combine with the haloid silver salt to form an organic compound of silver which is sensitive to the light reflected from various colors according to the particular dye employed; and in this way it is possible to obtain a plate which will be sensitive to the light reflected from all the colors of the spectrum, though for convenience in working, the extreme red is generally excluded, or otherwise the plate could be made and handled only in complete darkness.

The processes of Lumière and others are essentially the same as that of Ives, varying in the details of working.

In the working of the three-color process the negatives are taken through color-screens of red, green, and blue-violet, adjusted for use

with the Cadett spectrum plate. By means of a repeating back used in connection with a frame containing the screens, these may all be taken upon one plate; that is when the size of the picture required is small, such as is suitable for a lantern-slide. The length of exposure varies with each of the screens, an ordinary ratio being, say, 55, 13, 4 for the red, green and blue-violet respectively; but on account of unavoidable variations in different batches of emulsion, largely due to the difficulty in obtaining gelatin of uniform quality, these ratio exposures are liable to differ, but can be readjusted without great difficulty by making a trial exposure upon some subject with well-marked high lights and half-tones, such as a crumpled piece of white blotting-paper, which should appear equal in all three negatives. The length of the exposure through the red screen may be gauged by a fraction tint actinometer, by timing to a certain tint; from the time thus obtained the remaining two exposures can then be calculated from the ratio numbers.

There is a special form of camera in which the exposure for the three negatives can be made simultaneously by means of mirrors.

The plate must be developed either in darkness or by a special "safe" light supplied for use with such a plate, and a developer of the rapid type used, yielding a soft negative of good gradation without stain. Correctness of exposure is essential, forcing development being almost certain to result in failure. Intensification and reduction can be effected only at great risk of interfering with the gradation of the image, and should never be resorted to unless it is impossible to make another exposure. The best intensifying re-agent is said to be mercuric iodide with sodium sulphite.

The next step is the production from the negatives of the three positives, and first we produce a blue—or rather greenish-blue—positive from the negative obtained through the red color-filter. This, in the Sanger-Shepherd process, is done by first making a lantern-slide positive in the ordinary way by contact, taking care to secure one of good quality and well representing all the detail and gradation in the negative clear and free from fog, for the density and detail of the finished slide will largely depend upon the blue positive. This, after fixing and washing, is treated with a solution of potassium ferri-cyanide, again well washed, then immersed in a solution of ferric salt, rinsed, and replaced in the fixing solution, and finally again washed to free from hyposulphite. The effect of this is to convert the deposit of silver into one of Prussian blue. When dry this plate should be varnished, preferably with a solution of celluloid.

The remaining two positives, the pink and the yellow, are produced by modifications of the carbon process. A celluloid film coated with an emulsion of silver bromide in soft and soluble gelatin is employed. This is sensitized by immersion in a solution of potassium or ammonium bichromate, and, when dry, printed in contact with the two other negatives, care being taken to place the celluloid side next the film side of the negative. The necessary exposure varies from 1 to 10 minutes, according to the light, and should be gauged by means of the fraction tint actinometer. The silver bromide takes no part in the formation of the image, its func-

COLOR PRINTING

tions being to afford some guide in the exposure and development by giving a faintly visible image, and to assist in the more rapid disintegration of the gelatin in the warm water used for the development. The water used should be of a temperature of from 90° to 100° F., as in the carbon process, and when all the soluble portions which have not been acted upon by light are removed, the silver bromide is dissolved out by a solution of hyposulphite, leaving the almost invisible photographic image in relief in clear gelatin. The positive thus obtained from the negative taken through the green filter is then immersed in a dye-bath of a pinkish-red color, and that from the negative taken from the blue-violet filter in one of a yellow color, and they are stained to the required depth, comparing the result by holding in approximate position occasionally with the blue positive, without touching each other. It is usually better to overstain these positives and then wash down in water to the required depth of color.

The blue positive may be obtained in similar manner upon a thin celluloid support, using a weak solution of methylene blue as the stain, and this method is preferred by some workers. The advantage, however, rests with the prussiate process, in that a positive is produced of maximum sharpness, being printed in actual contact, without the necessity for the interposition of the celluloid, this being more essential in the case of the blue print, which forms the foundation of the finished slide, for however slight the diffusion may be, it must necessarily be more apparent if it exists in each of the three monochromes.

In the method of working recommended by Messrs. Lumière the three stained positives are produced upon a mica support. The mica has the great advantage of rigidity, but the still greater disadvantage of frequently failing to retain the gelatin film, which will sometimes float off, even in the bichromate sensitizing solution.

The pink and yellow positives, having been dried, are placed in register with the blue, and any preponderance or inequality in coloring noted. This can be corrected by careful reduction, in cold water, of either the pink or yellow films. The greens are usually the best guide, as, if these are correct, the other colors will usually be bound to follow. If the blue be at fault, it will be found better to make another rather than attempt to alter it. When finally adjusted and dry, the two celluloid films are varnished with a special transparency varnish, in order to prevent the colors from running. The three positives may now be placed in accurate register and bound up with a cover glass as usual, but the transparency and unity of the complete positive will be much improved by mounting in Canada balsam. This is effected by first fixing the two celluloid positives on one edge of the blue plate, by trimming first the pink, so that when it is in register there is a margin of at least one eighth of an inch of the blue extending beyond it, then the yellow, so that the pink extends beyond it for the same distance. The three can then be fixed down by a piece of lantern binding strip, or better and more securely, by a thin strip of paper firmly fastened down with fish-glue, as the gum of the binder does not always adhere securely

to the celluloid. The three positives and the cover glass are then made warm; the Canada balsam, thinned by heating in a beaker, poured in a sufficient quantity between each of the positives and also under the cover glass, and the excess pressed out; the whole being then placed between strong spring clips till set; after which the slide can be cleaned with alcohol and masked and bound up as usual. Should any separation or bubbles occur, these may generally be remedied by again warming the slide and replacing it in the clips for a few hours.

The three-color process has assumed much importance as a means of producing colored prints. To do this, the process is modified to produce three half-tone plates, the negatives being taken through filters of the complementary colors, and from these the prints are made by the use of suitable inks, the impressions being made accurately one over the other. Here the primary colors are represented by pigments of red, yellow, and blue (as before noted) and the colors overlapping and mingling produce, approximately at least, the various tints required.

It has been recently reported that Prof. A. B. Leckenby has devised a new method of color photography, the details of which have not yet been made known. The method is said to be the same as the old system of photography up to the making of the print. The difference lies in the emulsion of the sensitive paper. The slight differences in the shades on the negative plate are just enough to act in different ways on the paper during printing, and produce the several colors. One fault has been found with the pictures; they are not all the same shade. A red rose may show pink at one time, and with the next toning and fixing, a dark crimson. In either case the color will still be red, but the shades will be decidedly different. Even this objection, which is not in itself very serious, Dr. Leckenby thinks will be remedied, and he has worked out a method which will have the effect of bringing the various prints to a more even tone.

Color Printing, the art of producing pictures, designs, cards, etc., in various colors by means of lithography, printing from metal blocks, etc. The ordinary methods are: (1) The chromo-lithographic, in which a tracing of the original picture, or the like, is first made, and a copy transferred to as many stones as there are colors in the original, every color requiring a fresh stone. The drawing on each stone is made to fit in, or register, with the preceding one, and as the paper passes through the machine an additional color is added every time, and thus the picture is built up, color upon color (each being allowed to dry before the next is put on), until it is completed. Some chromos or oleographs may have as many as 25 or 30 printings or colors. (2) Block or surface color-printing is specially adapted for book illustrations, or work where nicety of detail or rapidity is required. As in chromo-lithography, various printings are necessary; but these are reduced in number by printing several tints of the same color at one operation. Each block, which is usually of zinc and prepared in the usual way, is capable of producing three or more gradations of the same color; the darkest shade from the normal surface, lighter shades being

COLORADO

got from parts which have been bitten or corroded in an almost imperceptible degree—the deeper corrosions giving the lightest shade. When the tints of one color are thus printed from one block and at one operation, a second block with gradations, in the same way, is used, registering as in chromo-lithography, and so on till the picture is finished.

Colorado, kŏl-ŏ-ră'do, the "Centennial State" (admission to the Union planned for 4 July 1876, consummated 1 August), is bounded north by Wyoming and western Nebraska, south by New Mexico and western Oklahoma, east by Kansas and Nebraska, west by Utah. Capital, Denver. Area, 103,925 square miles (280 of it water). Pop. (1900) 539,700, (1907) 700,000.

Topography.—Eastern Colorado, one-third the total area, is the westernmost portion of the great treeless plains that continue the Kansas prairies. Near the abrupt rocky faces of the mountains, they rise in low sharp-ridged foothills, called "hog-backs," composed of an extensive series of fresh water and marine formations (remnants of the junction of sedimentary with primary rock). The remainder of the State belongs entirely to the Rocky Mountain system. The Front Range connects the plains with the main range of the system. The western portions fall in minor slopes toward the Pacific. Colorado contains the greatest mass of high land in the United States, if not on the continent.

The main mass of the Rockies crosses Colorado in two principal lines of elevation. The eastern or more recent line, is composed of the Medicine Bow Range, which extends into Wyoming; the Front Range, the one first encountered by the early emigrants and still crossed by the main line of transmontane travel, the Sangre de Cristo and the Culebra. The western, or main line, is composed of the Park Range from the north and the Sawatch Range, which is a continuation of the Sierra Madre of Mexico. West of these main lines lies a complicated series of broken ranges and plateaus, parallel, lateral, and oblique, but with a general trend northwest and southeast. Of these the principal ones are the Roan, or Book, north of the Grand River in the extreme west; the Uncompahgre parallel to the Gunnison River on the south; the San Miguel further south; the San Juan to the east; and the Elk near the centre obliquely to the Sawatch (incorrectly spelled Sogauche). The Elk is a very notable range about 30 miles long, geologically interesting from the extraordinary displacement of strata, with a number of lofty and rugged summits; Castle Peak, 14,259 feet; Maroon, 14,003 feet; Snow Mass, etc.

The best-known peaks in the State, Longs (14,271) and Pikes (14,108), noted landmarks of the emigrant trail, are in Front Range, which also contains Audubon, Arapahoe, James, Rosalie, Grays (14,341), Torreys (14,336), and Evans (14,330). The loftiest range, as a whole, is the Sawatch, a granite mass over 13,000 feet high for many miles together and from 15 to 20 miles wide. Its peaks are Harvard (14,375), Princeton (14,196), Yale (14,187), and others. After a depression of 18 miles, the range rises in the Mountain of the Holy Cross, where a deep ravine and a transverse fissure outline a

gigantic cross in the snow. The highest point in the State is Mount Massive (14,424).

The great passes are far higher than any mountain summits east of the Rockies. There are 15 over 10,000 feet above sea level. Alpine (13,550), Cottonwood (13,500), Argentine (13,286), Marshall (10,841), Tennessee (10,418), and Fremont (11,313).

Lying between the two parallel elevations are four great parks which are separated from each other by cross ranges. By far the largest is San Luis Park, which extends into New Mexico and has an altitude of about 7,000 feet and lies between the Sangre de Cristo and Culebra ranges on the east and the Sawatch on the west and is more nearly level than the plains. It is nearly the size of Massachusetts. It is drained by the Rio Grande through the southern centre, while the mountain streams of the north flow into the San Luis Lake, the largest lake in Colorado. North of San Luis Park is South Park, between Front and Mosquito ranges, 8,000 to 12,000 feet high, and about the size of Rhode Island. Further north is Middle Park, still more elevated and somewhat larger. Lying between Medicine Bow and Park ranges is North Park, the second in size. There are many smaller parks, the most famous of which are Monument Park and the Garden of the Gods near Colorado Springs, in the latter "rise towers and pinnacles consisting of the vertical strata of the white Dakota sandstone and of the red triassic sandstone below. Some of these huge masses rise vertically for 200 or 300 feet, and serve as examples of erosion of steeply upturned strata of varying consistency. Lower white ridges of Jurassic gypsum or Cretaceous limestone afford strong contrast in color when compared with the red sandstone."

River Systems.—The main Rocky Mountains must obviously be the greatest of American watersheds; and chief source of river systems, except Minnesota; they contain the continental divide between the waters flowing to the Atlantic and those flowing to the Pacific. One part of it is the southern boundary of North Park, the streams of which flow north to the Platte-Missouri-Atlantic system, those south of it feed the Grand-Colorado-Pacific; another is between Creede and Ouray, separating the headwaters of the Rio Grande from those of the Gunnison and Uncompahgre of the Colorado system. The eastern plains are divided chiefly between the two great systems of the Arkansas and the South Platte; the former occupies more than one half their area in the State, the southern portion; the South Platte, the larger portion of the northern half; between them on the east is a section draining into the Republican River, an affluent of the Kansas. The South Platte rises in South Park; the Arkansas in the mountains west of it, Leadville lying on one of its head creeks. Except for these and the Rio Grande in San Luis Park, the mountain section is almost entirely drained by the Colorado River system; the Yampa (or Bear) and the White, in the northwest, flowing to the Green; the Grand through the centre, with its chief affluent the Gunnison from the south; and the Dolores in the southwest.

Of equal fame with the giant peaks and even greater beauty, are the stupendous mountain cañons through which its rivers cut their way.

COLORADO

Western Colorado forms the eastern edge of what Major Powell has called the Plateau Province; and all the wonders and beauties of this remarkable region are found in Colorado. There are the terraced platforms, ending in rock faces dropping sheer upon other platforms hundreds of feet below, and ending in vertical gorges from 1,000 feet to a mile in depth, where the sand-laden currents with a steep fall have cut their channels through countless strata of brilliantly variegated sedimentary rock; here are barren mesas, and cool grassy forested levels and slopes above the plane of perpetual drouth where the mountains bar off the vapors; rock headlands around curves or junctions of streams or gullies, fantastically carved in striking likeness to the work of human architects. The cañon of the Grand, the Black Cañon of the Gunnison, the Royal Gorge, a part of the Grand Cañon of the Arkansas, are famed for their beauty and their grandeur.

Climate and Rainfall.—The dry, cool, thin air of mountain Colorado makes its accessible eastern portions, especially the parks, widely famed as sanatoriums for patients with asthmatic or pulmonary diseases. Colorado Springs, the Rocky Mountain Saratoga, is built up by eastern invalids. The summer days are sometimes hot, but the dry air and bare rocks cause so rapid a radiation that the nights are always cool and dewless. There is little severe winter cold, zero being rare; the frost season is short, and the snows, seldom deep, soon melt, except on the mountains. The January mean temperature for the leading places is about 28.5°F.; the July 72° to 74°F. The average rainfall is 14.8 inches, fairly even through the State, though naturally much heavier on the higher levels, varying from nearly 30 inches at Pikes Peak to 12 inches at Las Animas in the Arkansas plains. Hence, agriculture can be carried on without irrigation in many mountain regions, though better with it.

Surface, Farming, Stock Raising, and Irrigation.—There are about 16,000 square miles of forested land in the State, the trees being mostly conifers, with cottonwoods along the eastern streams. Of the 40,000 square miles of plain and parks, about one-third is arable, the rest being grazing-ground, to which, however, must be added many thousand miles of grassy mountain slope. The pasturage in many parts lasts through the winter; and the plains are covered with gorgeous wild flowers. The soil of the plains is mostly sandy loam, with some clay. Along the water-courses the soil is rich, but the rainfall is not sufficient, and irrigation is needed; but is scarcely feasible there except along a few large streams, or near the mountains. But the system of dry-farming promises to extend largely the area farmed. But there is an estimated irrigable area of 4,800,000 acres, or 7,500 square miles, in the State; and in recent years an immense amount of energy has been turned to utilizing its possibilities. The land within reach of mountain streams had been so improved thereby that in 1900 Colorado was first in the United States in extent of land irrigated, and was surpassed only by California in number of irrigators and value of crops raised by irrigation. The average size of farms is much larger than in California. But of all the land under cultivation in 1900, 70.9 per cent.,

or 1,611,271 acres, was irrigated, against little over half that in 1890. Of this amount over one-third is in a solid block along the South Platte, at the northeast corner of the mountains in the State; the next greatest, nearly a fifth of the whole, in San Luis Park. There are lines along the South Platte and Arkansas; blocks on the Grand in Mesa County, on the Gunnison in Delta and Montrose, and again in Gunnison County; scattered sections on the White and Yampa, along the southern Arkansas tributaries, and indeed in every quarter of the State. There were 1,890 gravity irrigating systems in all, with 7,374 miles of main ditches; besides 277 artesian wells. Each mile of ditch had side ditches covering 390 acres; but only 218 were actually irrigated, from lack of water. The last census year was, however, one of abnormally small rainfall. The cost of construction per mile was \$1,569; per acre, \$7.21. In 1906, the length of main ditches was about 10,500 miles; of laterals, more than 7,000; total number of acres that can be irrigated under these main ditches 3,500,000, but not more than 2,350,000 are under cultivation. The State is divided by law into five irrigating divisions: the South Platte—the richest farming section of Colorado—irrigating 921,675 acres; the Arkansas, Rio Grande, Grand, and San Juan.

The most important single crop of Colorado is hay, now amounting to some \$20,000,000 a year in value. Two-thirds of this is alfalfa, whose great yield and nutritious qualities make irrigation worth while, and most of it is grown by means of irrigation. The next is wheat, 7,207,111 bushels in 1900. It had more than doubled in the decade, and it makes the highest priced flour on the market. Potatoes rank third; the soil is admirably adapted to them, and in 1900, 4,465,748 bushels were raised, against 383,123 in 1880. The sugar-beet industry has become of the first importance. There are 15 large beet-sugar factories in the State which in 1906-7 are estimated to have utilized a crop of 1,477,700 tons of beets harvested from 111,670 acres producing 310,317,000 pounds of sugar. Amount paid for beets and labor, \$9,399,500. Number of persons engaged in beet culture and sugar manufacture, 23,475. In it the State ranks second of the United States. The only other crops of first-rate importance were oats, 3,080,130 bushels; and corn, 1,275,680 bushels. (3,000,000 bushels in 1906). Others, however, are rapidly becoming valuable specialties. Barley is increasingly raised for brewing. With irrigation fruit-culture is assuming large proportions; especially the growing of apples, which has arisen from nearly nothing in 1890 (77,798 trees and some 10,000 bushels) to 2,004,595 trees and 257,563 bushels in 1900. Over 80,000 bushels of peaches, pears, and plums were also grown. In 1906, 85,000 acres were planted with fruit trees and vines which produced a crop worth \$8,000,000. Most of the fruit-raising is in Delta, Mesa, and Montrose counties, on the Grand and Gunnison, in Boulder County, on the South Platte, and in Fremont County, on the upper Arkansas. A valuable crop on the Arkansas is that of muskmelons, including the famed Rocky Ford cantaloupes.

Stock raising has increased with the production of feed, or vice versa. In 1900 the value

COLORADO



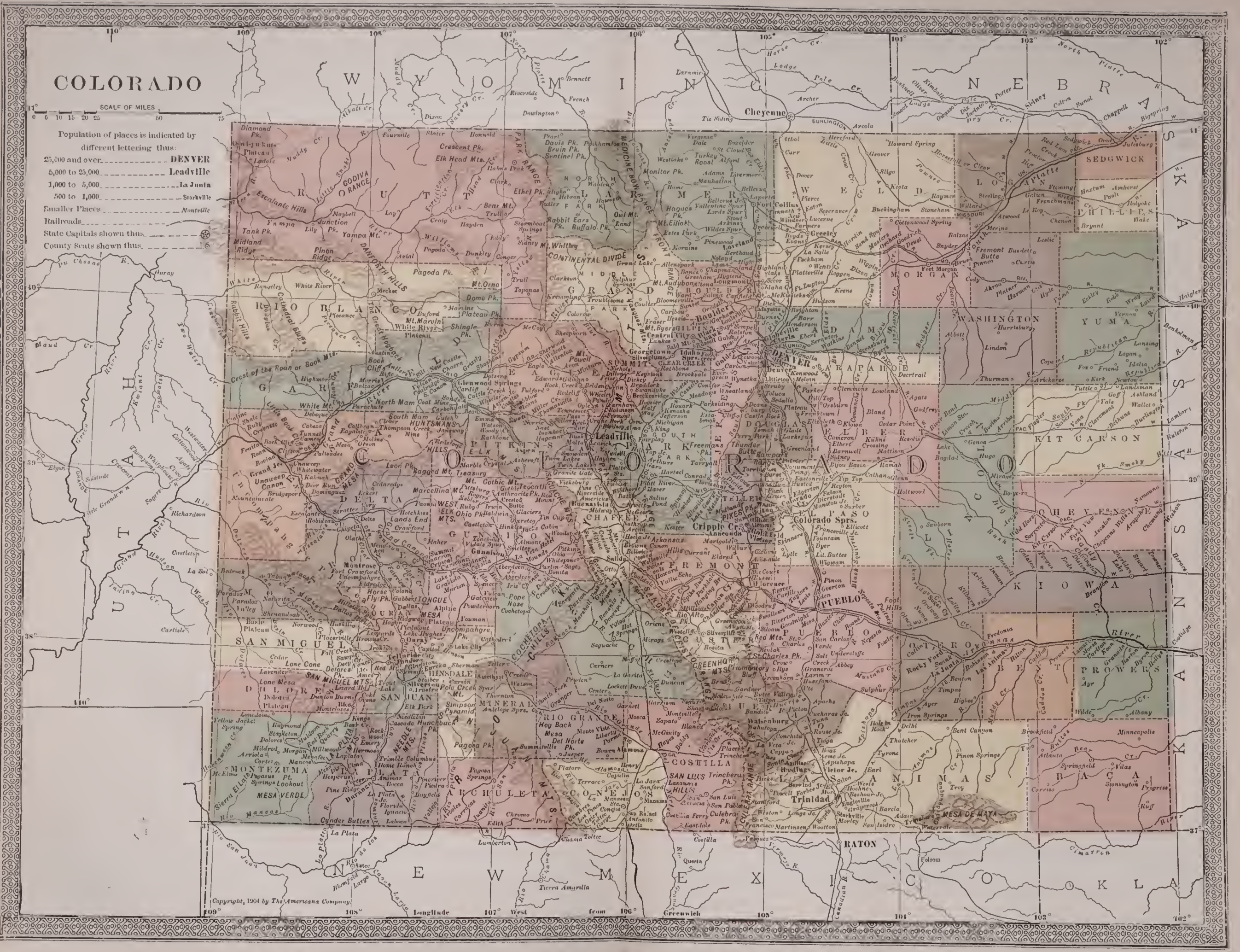
Population of places is indicated by different lettering thus:

- 25,000 and over ----- **DENVER**
- 5,000 to 25,000 ----- **Leadville**
- 1,000 to 5,000 ----- **La Junta**
- 500 to 1,000 ----- **Starkville**
- Smaller Places ----- **Montville**

Railroads -----

State Capitals shown thus

County Seats shown thus



COLORADO

of Colorado live stock was \$49,359,781; the number of neat cattle more than doubled in the decade (640,913), as it had done in each decade since 1870; and sheep, swine, and horses increased 50 to 75 per cent. The quality improved even faster than the quantity. Colorado ranchmen have been among the foremost to import blooded bulls to breed up the native stock, and in 1900 the average price of bulls was \$55.26, the highest in all the States save one (Wyoming), against \$34.49 for the whole country, and \$15.26 for the South Atlantic States. This breeding is displacing the Texas long-horn with blooded stock, and the average herd is smaller and better looked after. Dairying has increased by a third in the decade. There were 76 creameries and 27 cheese factories in the State in 1901, and a large condensed milk factory was built. Recently the tendency to consolidation has been marked and there are now not more than 36 creameries and 14 cheese factories. Sheep and wool form the wealth of several counties.

Stock feeding—a very important industry—has developed in the San Luis Valley where field-peas grow luxuriantly. Dry-farming is now attracting much attention. Many square miles of plain and hillside that were thought to be worthless are bearing valuable crops, thus increasing the tillable land by 12,500,000 acres.

Geology and Mining.—The main ranges, particularly the east range, have a core of schist and gneiss with an occasional area of granite. These main ranges are flanked on all sides with sedimentary rocks. In many cases, these rocks show practically all the geological epochs from Cambrian Quartzite to the Quaternary, while again the most recent is found resting on the most ancient. There are large areas of purely eruptive rock, such as the San Juan range in the southwest and the Spanish Peaks, near Walsenburg. The prairie land is so completely clothed with soil that it is difficult to follow the geological skeleton, but it is probable that nearly all geological periods are represented in its formation. Great coal deposits are found in the upper Cretaceous, and most of the metallic deposits are found in igneous formations.

Colorado leads the Western States in mineral production. Total output (1903) \$65,284,009; (1904) \$68,870,280; (1905) \$89,309,861; (1906 estimated) \$111,617,120. The output (1905) of leading minerals was as follows: gold, \$25,577,946; silver, \$7,743,718; lead, \$5,438,506; zinc ore, \$4,774,497; copper, \$1,536,266; clay products, \$1,663,231. The production of zinc (worth \$6,000,000 in 1906) is second to that of the Missouri-Kansas field. Most of the ore is shipped to Eastern smelters. Boulder County produces 80 per cent. of all the tungsten mined in the United States (\$250,000). Iron sulphides are mined at Creede and other places from which sulphur is obtained in paying quantities. Uranium and vanadium are found in large quantities. There is a vast quantity of oil shales in the northwest. The output of silver is steadily increasing. About three-fourths of the silver is from lead ores, and Colorado's lead product is one-sixth of that of the whole country. Lead is not only sold as a raw material, but is a most valuable flux for smelting gold and silver ores, therefore large quantities are imported from other states. The mines of

Cripple Creek and Leadville are among the best equipped in the country. Cripple Creek is the leading gold-producing section in the State and Leadville leads in the production of silver, lead, copper, and zinc.

As a coal-producing State, Colorado ranks sixth. There were mined in 1906, 11,240,000 tons, about one-half coming from Las Animas County in the south central part of the State. Marble, fuller's earth, potter's clay, fire clay, cement shales (the finest in the world), limestone and abrasives, petroleum and natural gas are valuable and abundant minerals. The Florence oil fields produce the finest oils in the world.

Manufactures.—The chief industries of Colorado could be predicted from a glance at its raw materials—precious metals, copper and lead, coal and iron, wood, cattle, and grain. These mean smelting, iron and steel and railroad work, lumber manufacture, meat-packing, flouring-mills and breweries. In 1905 there were 1,606 manufacturing establishments in the State; the capital invested amounted to \$107,663,500; there were 21,813 wage earners, whose wages aggregated \$15,100,365; the cost of materials used was \$63,114,397; and the value of the products was \$100,143,999. The 1905 census does not include separate figures for the leading industry of the State—smelting and refining—and those for 1900 are given. In that year the product of the works, smelting and refining lead ores or with lead, was valued at \$40,732,271, investment of capital \$22,569,715, wages paid \$2,390,383. Copper-smelting embraced about one tenth as much capital and product, and paid one eighth as much in wages. Iron and steel were second, with \$2,903,136 capital, \$6,108,295 product, and \$710,742 wages. The great advantage of Colorado in having its iron, coal, and flux close together has given it a practical monopoly of the market west of the Mississippi. Foundry and machine-shop products in 1905 were valued at \$4,107,986; wages \$1,061,882; and car-shop work is dependent on iron and lumber, \$5,259,183 product, \$2,264,859 wages. Flouring and grist-milling showed \$5,783,421 product, \$202,778 wages; wholesale slaughtering and meat-packing, \$3,323,503 product and \$175,419 wages; malt liquors, \$2,120,187 product, \$242,978 wages; lumber, timber, and planing-mill output, \$2,467,568 product, \$884,362 wages. Colorado industries pay about \$1,000,000 a year internal revenue tax.

Railroads.—Colorado has about 5,000 miles of main track of steam roads; besides well-developed electric systems, not only in cities, but between mining camps. A number of great trunk lines cross the State; while short lines pierce to the heart of its mountain districts, giving the best transportation service of any State along the Rocky Mountains. The chief systems are the Union Pacific, the Missouri Pacific; the Atchison, Topeka & Santa Fe, the Denver & Rio Grande, the Rock Island, the Colorado & Southern, the Colorado Midland, the Rio Grande Western, the Burlington, the Denver & Northwestern (the Moffat Railroad). Within the past few years two important branch lines have been built from Denver, connecting with the Burlington and the northwestern systems.

Finances.—In 1906 the assessed valuation

COLORADO

was about \$350,000,000 and the bonded debt was \$393,500. The tax for state purposes is \$4.00 per \$1,000.

Banks.—March 1907, there were in Colorado, national banks, 99; private banks, 76; state banks and trust companies, 86, with a total capital of \$14,647,950, and a total deposit of \$125,435,000, an increase of over 50 per cent. in four years.

Churches.—There are about 700 churches and 1,000 Sunday schools in the State. The Methodists, Presbyterians, Roman Catholics, Baptists, Congregationalists, and Disciples of Christ are the strongest denominations, while the Episcopalians, Lutherans, and other denominations have many churches throughout the State. The various denominations are very aggressive both in spiritual and secular affairs. The Jews are a very important element in Colorado civilization; they number not less than 10,000.

Education.—The school system, the efficiency of the teachers, and the equipment of the school-houses place Colorado with the States that lead in educational affairs. Of the 187,130 children of school age (1906), 144,007 were in attendance at the public schools, while many were in private schools; number of teachers, 4,600; amount paid in salaries, \$2,445,668; value of school property, \$9,513,458; total expenditure, \$4,486,226. The institutions of higher learning are The University of Denver (1864, M. E.), the pioneer institution of higher learning in the Rocky Mountains, with 170 professors and 1,392 graduates; Colorado College (1874, Congregational), 43 professors; University of Colorado (1877, State), 112 professors, 908 graduates; College of the Sacred Heart (1884, Jesuit), 18 professors and 82 graduates. The State supports the School of Mines at Golden, ranking among the best of the world, and a Normal School at Greeley, with a large efficient faculty and 965 graduates to its credit. The Universities of Colorado and Denver maintain medical schools. Many private schools are maintained; they are located in Denver, Boulder, Cañon City, Leadville, and other cities of the State. Two other institutions are in process of organization: The Colorado Woman's College (Baptist), and the Westminster University (Presbyterian), both located at Denver.

Charitable and Penal Institutions.—Each of these has a Board of Control, under general supervision of the State Board of Charities and Corrections. Besides the care of the poor by the counties and some city institutions, as elsewhere, there is a State insane asylum at Pueblo and a Soldiers' and Sailors' Home at Monte Vista. The State Prison is at Cañon City. The prisoners have been employed in purely institutional labor on the inside, and road-making in Fremont County on the outside. The session laws of 1907 provide that all prisoners in the penitentiary and reformatory shall be employed in working for the State, making articles needed at the various State institutions, or in road-building. The prisoners may receive compensation, graded by the warden. The money credit may be drawn on for the family of the prisoner. The balance becomes his on his absolute discharge. All able-bodied prisoners confined in any jail must be employed at hard labor, not less than eight hours each day. The indeterminate sentence is used. There is a State reformatory

and farm at Buena Vista, and an industrial school for juvenile offenders at Golden, where the inmates are not confined nor marked with penal badges; the appeal is to their honor. There is an industrial school for girls at Morrison, where girls may be detained until 21 years of age.

State Government.—The State constitution, which was largely modelled after that of Illinois, was ratified 1 July 1876. Colorado was admitted to the Union by proclamation of the President 1 Aug. 1876. A few important amendments have been made to the constitution. The most important are the one that provides optional home rule for certain cities and the one that gives women the right of suffrage. The suffrage amendment was voted in 1893. The women have full right to hold office. In the State the office of Superintendent of Public Instruction and in many counties the offices of County Superintendent of Schools are conceded to the women. It has been a number of years since any woman has been elected to the General Assembly.

Executive.—Executive officers, except members of the Railroad Commission, hold office for two years. The governor (salary \$5,000) may veto any bill and specific items in an appropriation bill. In either case the veto may be overruled by a two-thirds vote of each house. The Railroad Commissioners are appointed by the Governor to serve until 12 Jan. 1909. Their successors must be elected at the regular state election in 1908. The regular term is six years, salary \$3,000.

Legislative.—The General Assembly meets biennially, the 35 senators are elected for four years and the 65 representatives are elected for two years. The constitution limits the total membership of the two houses to 100 members.

Judiciary.—The Supreme Court consists of seven members, elected for 10 years. The court is divided into three departments. The Chief Justice, who is the Judge having the shortest term to serve, providing he has been elected for the full term, presides in each department. Constitutional questions must be heard by the full bench, other questions may be. There is no appeal from the decisions of a department. The district judges are elected for six years and the county judges for four years.

Militia.—The National Guard, a part of the militia of the State, consists of one regiment of infantry, one squadron of cavalry, one company of field artillery, one signal corps, one hospital corps. The complete organization contains 1,000 men.

Population and Divisions.—The first (Territorial) census, that of 1860, showed 34,277 people; 1870, 39,864; 1880, 194,327; 1890, 412,198. The census of 1900 showed a population of 539,700. The foreign-born numbered 91,155. Of these, 27,441 were from England, Scotland, and Canada; 14,606 were from Germany; 10,765 were from Sweden; 10,132 from Ireland; 6,818 from Italy; and 6,024 from Austria (probably in the main Hungarians and Slavs). Counting the north of Ireland English, probably a third of the foreign-born were English. The negroes numbered 10,654. The enormous predominance of males usual in a mining district had dwindled with the settled industries, and the males were under 55 per cent.



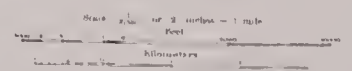
DEPARTMENT OF THE INTERIOR
 UNITED STATES GEOLOGICAL SURVEY
 CHARLES D. WALCOTT, DIRECTOR
 RECLAMATION SERVICE
 E. L. NEWELL, CHIEF ENGINEER A. DAVIS, ASSISTANT CHIEF ENGINEER

UNCOMPAIGRE VALLEY PROJECT
UNCOMPAIGRE VALLEY
COLORADO

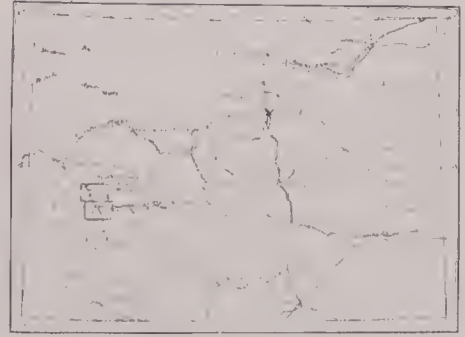
TOPOGRAPHIC AND IRRIGATION MAP

A. E. FELLOWS, DISTRICT ENGINEER J. W. MCKEE, DISTRICT ENGINEER

Surveyed in 1901-04



The boundaries and the water rights shown on this map are those shown on the maps of the Survey of the Uncompaigre Valley, Colorado, published in 1901-04.



EXPLANATION

Irrigation canals	—
General ditches	—
Feeder	—
Low levels	—
Triangulation line	—
Section line	—
Triangulation lines	—
Boundaries	—
Streams	—
Contours	—
Irrigation stations	—
Water marks	—

COLORADO AGRICULTURAL COLLEGE — COLORADO COLLEGE

There are 59 counties in the State, as follows, with their county-seats:

Adams, Brighton.	La Plata, Durango.
Archuleta, Pagosa Spr'gs.	Larimer, Fort Collins.
Arapahoe, Littleton.	Las Animas, Trinidad.
Baca, Springfield.	Lincoln, Hugo.
Bent, Las Animas.	Logan, Sterling.
Boulder, Boulder.	Mesa, Grand Junction.
Chaffee, Buena Vista.	Mineral, Creede.
Cheyenne, Cheyenne Wells.	Montezuma, Cortez.
Clear Creek, Georgetown.	Montrose, Montrose.
Conejos, Conejos.	Morgan, Fort Morgan.
Costilla, San Luis.	Otero, La Junta.
Custer, Silvercliff.	Ouray, Ouray.
Delta, Delta.	Park, Fairplay.
Denver, Denver.	Phillips, Holyoke.
Dolores, Rico.	Pitkin, Aspen.
Douglas, Castlerock.	Prowers, Lamar.
Eagle, Redcliff.	Pueblo, Pueblo.
Elbert, Kiowa.	Rio Blanco, Meeker.
El Paso, Colorado Spr'gs.	Rio Grande, Del Norte.
Fremont, Cañon City.	Routt, Hahns Peak.
Garfield, Glenwood Spr'gs.	Saguache, Saguache.
Gilpin, Central City.	San Juan, Silverton.
Grand, Sulphur Spr'gs.	San Miguel, Telluride.
Gunnison, Gunnison.	Sedgwick, Julesburg.
Hinsdale, Lake City.	Summit, Breckenridge.
Huerfano, Walsenburg.	Teller, Cripple Creek.
Jefferson, Golden.	Washington, Akron.
Kiowa, Sheridan Lake.	Weld, Greeley.
Kit Carson, Burlington	Yuma, Wray.
Lake, Leadville.	

There are 27 places in Colorado of over 2,000 people; 17 of over 3,000; and 8 of over 4,000. The metropolis is Denver (q.v.), on the east flank of the Rocky Mountains, north of the centre, with 133,859 inhabitants in 1900 (estimated in 1906 200,000) having nearly quadrupled in 20 years; the head of the Rocky Mountain trade, and chief United States market for ranching, prospecting, and mountaineering supplies. Pueblo with 28,157, and Colorado Springs with 21,085, are on the same front line of the mountains: the former a mining emporium; the latter the greatest sanatorium of the West. Leadville, 12,455, is the head of a great mining district on the upper Arkansas west of South Park; Cripple Creek, 10,147, is the centre of its rich mining region, west of Colorado Springs; Boulder, 6,150, in the mountains northwest of Denver, is a sanatorium with medicinal springs, also a manufacturing town; Trinidad, 5,345, in the extreme south, is the southernmost of the frontal towns, below Pueblo; Victor, 4,986, is one of the Cripple Creek settlements.

Colorado towns are growing so rapidly that the figures of the census of 1900 give a very inadequate idea of their population or importance.

History.—Colorado (Sp., pp. of verb *Colorar*, to color; colloquially used for red-colored) was named either from the river of that name or from the varied colors of the landscapes. Its territory is composed of three portions: one from the Louisiana Purchase; one from the Texas Cession; and the third from the Mexican Cession of 1848. The southwest portion was, in prehistoric times, inhabited by the Pueblos (the Cliff Dwellers). A few of the followers of De Soto and Coronado seem to have entered the territory of the State about 1541. It was explored in the southwest by Escalante in 1776, and its eastern mountain and plain regions by Zebulon Pike (1806) and Stephen H. Long (1820). Later John C. Fremont, led by Kit Carson, penetrated many portions of the Rocky Mountain region. Gold had been discovered in small quantities many times from 1806 to 1857

but the discoveries of 1858, near the confluence of Cherry Creek with the Platte, brought a large number of prospectors into the State. People from Georgia, Kansas, Missouri, and other Eastern States came in large numbers. Prospectors from Kansas and Georgia built Montana on the Platte near where Denver now stands; other towns followed; Auraria, St. Charles Town (now Denver), Golden, etc.

The discoveries of George A. Jackson at Idaho Springs on the south fork of Clear Creek and by J. H. Gregory on the north fork at Central City brought immigrants by the thousands. At once, local political organizations were made without regard to the territorial government of Kansas, of which Colorado was then a part. It was but a step from making laws for a mining camp to making laws for a whole district, from city building to State building. This step was soon taken. In 1859 delegates met and adopted a constitution for the State of Jefferson with an area somewhat larger than that of Colorado. The opposition to a State led to a second convention which, under the fiction of erecting a territory, established a new State and called it the "Territory of Jefferson." The constitution adopted by the first convention was ratified but never went into effect. The constitution adopted by the second convention was almost unanimously ratified 24 Oct. 1859, on which day a full complement of State officers was elected. R. W. Steele, who was elected governor, continued in office until 1861, when he surrendered his office to William Gilpin, first governor of the territory of Colorado.

Colorado was anxious for statehood, but it was not until party necessity compelled the majority party of Congress to turn to the west for more senators, that the enabling act was passed. The Constitutional Convention (in session 20 Dec. 1875—14 March 1876) provided that the territorial officers should become the State officers and serve until their successors were elected (at the regular election) and qualified.

Politics.—Colorado was admitted as a Republican State and is now (1907) Republican by a safe majority. It left the Republican ranks on the "money issue," but the improved methods of handling silver ore make silver smelting more profitable at present ruling prices than it was in 1896.

Bibliography.—Hubert Howe Bancroft's Works (Vol. XXV); Smiley's 'History of Denver'; Hall's 'History of Colorado.'

FRANK H. H. ROBERTS,
Professor of History, University of Denver.

Colorado Agricultural College, a coeducational institution at Fort Collins, Col., providing instruction in agriculture, mechanical engineering, veterinary science, etc., a four years' course leading to the degree of B.S. It was opened in 1879, and received a grant of 90,000 acres of land under the act of Congress of 1862. In 1904 there were 41 instructors and 433 students.

Colorado College, a coeducational non-sectarian institution in Colorado Springs, organized in 1874. It offers full collegiate courses and confers the degrees of A.B., B.S., and Ph.D. In 1906 the college reported 43 professors and instructors; 597 students; 39,800 volumes in the library; value of grounds and

COLORADO DESERT—COLORADO RIVER

buildings, \$500,000; annual income, \$41,000; president, William F. Slocum, LL.D.

Colorado Desert. See DESERT.

Colorado River, one of the chief streams of Texas. Rising in the high table-lands of Bexar, near the line of New Mexico, about lat. $32^{\circ} 30'$ N. and lon. 102° W., it flows southeast, receiving in its upper course the Conca, the San Saba, and the Lano on the south, and the Pecan from the north, and empties into Matagorda Bay. Austin, Bastrop, and Columbus are on its banks, and Matagorda near its mouth. For most of its course it flows through a fertile region, and has an average width of 250 feet. It is a clear stream; its name, meaning red, was originally applied to the Brazos, north and east, but the two were interchanged. The Colorado is some 900 miles long, and navigable to Austin or farther.

Colorado River, or Colorado of the West, a great river of the United States and Mexico, formed at about lat. 38° N. and lon. 110° W., by the junction of the Green and Grand rivers. The Green river rises in the Rocky Mountains in the west of Wyoming, receiving in its southwestern course the waters of the Bear, the White, the Uintah, and San Rafael. From Flaming Gorge, a point in the northwest of Colorado, where the Uintah Mountains rise, the Green River cleaves its way rapidly through cañons, the walls of which tower up to a height of nearly 1,500 feet. The Grand River rises in the Rocky Mountains, west of Denver, Col., receiving in its southwestern course the South Fork or Gunnison, the San Miguel, and Dolores. After the junction the Colorado flows southwest through Utah, joined on the east by the San Juan, on the west by the Dirty Devil and Escalante; southwest through the north of Arizona, till its waters are increased by the Colorado Chiquito, or Little Colorado of Arizona. Near the inflow of this tributary is the Marble Cañon, 3,600 feet deep and about one third the length of the greater cañon below.

From the mouth of the Little Colorado the river bends west and for more than 200 miles flows through the wonderful Grand Cañon. The successive divisions of the cañon are known as the Kaibab section, the Kanab section, the Uinkaret section, and the Sheavwitz section. The walls of this water-worn trench are often vertical, or nearly so, for a distance of thousands of feet at a time; sometimes they slope steeply, or constitute magnificent terraces. The cliffs or rock-walls attain a height of from 4,000 to 7,000 feet above the stream. (For heights of particular points, see CAÑON.) There are frequent whirlpools and waterfalls. Below the cañon the valley opens, and there is much fertile bottom-land on one or both sides of the river. Numerous tributaries pierce the high plateau on either side, the whole presenting a strangely intersected topography. Escaping from the Grand Cañon, the river flows southwest to the borders of Nevada, receiving from the west the Paria, Tapeat's River, the Kanat (of Arizona), and the Virgen (of Nevada).

Above Callville, Nev., the Colorado, as also its tributaries, again bores its way through deep cañons, the sides of which in some places present walls of solid rock nearly 7,000 feet high; the plateaus at the top of these rock masses, generally treeless, are again surmounted by ter-

aces 1,000 feet or more high. These lower and higher terraces are both piled with massive ruins, once the walled towns and cities of the Toltecs, as is supposed, a race said to be represented by the present Moqui Indians in the northeast of Arizona. Below Callville the river is again shut in by the last of the cañons, the Black Cañon, 25 miles long, and from 1,000 to 1,500 feet high. Shortly after receiving the Virgen, the Colorado takes a southerly course, severing Arizona and Sonora on the east from Nevada, California, and lower California on the west, and receiving on the east Bill Williams' Fork and the Gila. After absorbing the Gila the river sweeps round in a westerly direction for 7 or 8 miles, and soon expands to a width of 1,200 feet. Thence it pursues a tortuous course of 180 miles, the last portion being through Mexican territory, to its mouth in the Gulf of California. There is a vast delta or flood plain formed by the waste from rock erosion. From the sources of the Green River the Colorado measures a total length of about 2,000 miles. It is navigable for steamers as far as Callville, 612 miles from its mouth, and can be made navigable, it is thought, to the foot of the Grand Cañon, 57 miles higher. The first attempt to navigate the upper part of the Colorado was made in 1891. In 1893 the stream was proved navigable for 130 miles between Green River and Cataract Cañon.

The investigation of the geologists dispelled the theory once held that the Grand Cañon was a fracture of the earth's crust. It is now clear that a long period of erosion through plateaus successively uplifted has produced this remarkable gorge. At the bottom of the cañon throughout a considerable part of its course the Archæan system is laid bare. The Algonkian beds with their high coloring give brilliancy to that portion of the cañon where they can be traced. The Cambrian beds are found above the Algonkian, but in places rest directly on the Archæan. The thickness of the Cambrian (here known as the Tonto formation) is in places 1,000 feet. The upper part of the cañon walls consists of carboniferous formations (Red Wall formation below, Aubrey limestone and sandstone above). It has been estimated that all of the Eocene, Cretaceous, Jurassic, and perhaps Triassic beds and the greater part of the Permian were worn away from the plateau region during the period of erosion. The Marble Cañon platform, like that of the Grand Cañon consists of carboniferous strata with a considerable number of Permian remnants scattered over it.

In less than 50 years after the landing of Columbus, Spaniards explored the Colorado. In 1540 the river was visited by a detachment of Coronado's expedition and another of his exploring parties gave the first description of the Grand Cañon as seen by white men. About the same time Fernando Alarçon ascended the stream in boats for a long distance. Catholic missionaries subsequently traveled through these regions. For about 300 years, nothing more was learned concerning the Colorado. Much light was thrown on the subject by the investigations of Ives in 1858. In 1869 Powell explored the region and made the descent through the whole course of cañons to the mouth of the Rio Virgen, a distance of more than 1,000 miles.

COLORADO.



1. Pike's Peak, Showing Carriage Road.

2. Garden of the Gods.

COLORADO SCENERY.



1. The Dutch Wedding, in Monument Park.
2. Pike's Peak, from the Garden of the Gods.

COLORADO SPRINGS — COLORATION

Dutton made geological studies of the Grand Cañon in 1875. In 1889 the cañons were explored by a party of engineers sent out to make surveys.

Bibliography.—W. M. Davis, 'An Expedition to the Grand Cañon of the Colorado'; Dutton, 'Monograph II, U. S. Geol. Survey' (1882).

Colorado Springs, Col., a city and county-seat of El Paso County, on the Denver & R. G., the Denver T. & G., the Santa Fe R. I. & M. P., and the Colorado M. R.R.'s. It is situated on a plain at an elevation of 6,000 feet, near Pike's Peak and has a world-wide reputation as a health and pleasure resort. Colorado Springs is an attractive city and is the midway gate to the western section of the State. The celebrated mineral springs of Manitou attract many visitors.

Industries.—Colorado Springs was settled in 1870 and its wonderful growth since 1892 may be largely attributed to the development of the Cripple Creek gold mines, which are 30 miles distant on the opposite side of Pike's Peak. The gold output since the discovery of the district in 1891 has been \$136,000,000. A great part of this wealth flows into Colorado Springs, whose population has more than doubled in the past ten years, and whose bank deposits have increased 600 per cent. in the same period, and now amount to about \$10,000,000.

Buildings, Educational Institutions, Railways, Etc.—Colorado Springs boasts a handsome opera house and five clubs, one occupying an edifice worth \$80,000; 17 fine school buildings, Colorado College (q.v.), one of the oldest institutions of its kind in the State, with over 500 students, a State institution for the education of the blind and mute, sanitoriums, church edifices, 2 hospitals, and 6 trunk lines, 28 miles of electric railway and a modern telephone system.

Government, Etc.—The city is governed by a mayor, who is chosen biennially, and a city council. Colorado Springs has a water supply costing over \$1,000,000 and a sewerage system perfected at an expense of \$10,000,000. Pop. (1904) 24,000.

HENRY RUSSELL WRAY,
Secretary Chamber of Commerce.

Colorado Stage. The rocks of the Colorado Stage, one of the lower divisions of the upper Cretaceous Series, are all of marine origin and cover a great area, having been laid down in an interior sea that stretched from northern New Mexico, where it opened into what was then the Gulf of Mexico, to the Arctic Ocean. This sea at about the latitude of Duluth, Minn., was over 1,000 miles wide. The Colorado is separated into two sub-stages, the lower, or Fort Benton, clays, shales, and limestones, with a maximum thickness of 1,000 feet, and the upper or Niobrara, shales, sandstones, chalk, and chalky marls, with a maximum thickness of 2,000 feet. Along the northern border of what was the Gulf of Mexico, in Alabama and Mississippi the Colorado is represented by the rotten limestone 500 to 1,200 feet thick, and along the western shore of the gulf, across Texas into Mexico, by the Eagle Ford shales, 500 feet thick, and by part of the great chalk belt 300 to 600 feet thick, that stretches from Arkansas into northern Mexico. The Colorado Stage is of interest because of its marking the

time when more of North America was under water than since the Carboniferous Epoch, and because of the beds of chalk in South Dakota, Kansas, Arkansas, Texas, and Mexico. See CHALK; CRETACEOUS SERIES.

Colorado, University of, a coeducational institution at Boulder, Col., supported by the State. It was incorporated in 1861 by the Territorial legislature; when Colorado became a State in 1876, the Constitution provided that the university at Boulder should become the State University, thus giving it the advantage of the lands appropriated by the national Congress for such institutions. The University of Colorado commenced its work in September, 1877, with two departments, the collegiate and the preparatory. Since then the preparatory work has been gradually withdrawn from the university until the preparatory school has a separate organization; and the schools of medicine, law, and applied science have been added. The collegiate department offers courses leading to the degrees of A.B., Ph.B., and B.S. In 1903 there were over 500 students in the university proper, and nearly 400 in the preparatory school. The library numbers 26,000 volumes.

Coloration, Protective. The color of plants and animals is primarily due to the action of light, and is dependent on the pigment in the tissues of flowers, and in the skin, scales, hair, or feathers of animals. Plants are colored green by chlorophyll, so are caterpillars from eating plants; animals derive their colors from the waste matter of the blood. The "chromatic function" is that adaptation of color of the skin of the frog, chameleon, squid, fish, or crustacean, which rapidly changes so as to be assimilated to the tints of the objects on which they rest. In all animals the coloration is due to pigment-cells (see CHROMATOPHORES), which are more or less ramified, and which, under the stimulus of the prevailing color of the habitat, cause the animal to be assimilated in hue to the ground, or tree, or sea-bottom. In most animals the coloration is permanent, in a few it changes with the change of color of the immediate surroundings of the animal, as in the chameleon. In insects, fishes, and birds, where the variety of colors is almost endless, it is usually more or less protective, though, when the males are brightly colored this is the effect of sexual selection.

Pigment in Animals.—That this is primarily due to the action of light is proved by the fact that cave animals, or those living in darkness, are white or bleached out, so that the pigment cells become degenerate, the pigment losing its more or less dark color, while in insects the colors are either optical or natural; the pigments, when present, are formed in the cellular layer of the skin (*hypodermis*). The pigments are formed from the waste products of the blood which have not been carried away with the urinary excretions. These colors tend to fade after death, but when enclosed and preserved in air-tight sacs, such as the scales and hairs of butterflies, and the wing-covers of beetles, they remain bright for a longer time, though eventually fading when dried specimens are exposed to the light. It has been shown that red, yellow, brown, and black colors in the scales of certain butterflies are always due to pigments, while in a few cases greens, blues, violets, purples, and whites are due to

COLORATION

pigments in the scales themselves. Mayer finds that the pigments of the American silkworm moth (*telea polyphenmus*) are derived from the blood of the chrysalis. He has artificially produced several kinds of pigments from the blood, which are similar in color to various markings on the wings of the moth, and has found that chemical reagents have the same effects on their manufactured products as on similar pigments in the wings of the living moth.

Origin of Spots, Bands, or Stripes.—The markings of caterpillars, the stripes of the zebra, of many African antelopes, and of the tiger are supposed to be due to the direct effects of light and shade, to shadows cast in jungle-grass or in forests. The proofs of this are the experiments of Steinach, who glued strips of black paper to the skins of frogs which were kept in the dark; when they were exposed to the light, only the uncovered parts of their skins returned to a lighter hue, while the covered parts remained dark. The reflected green light in the case of frogs turning green when among leaves, appears to act directly upon the pigment cells. When the bottom of the vessel is covered with felt or with a wire net, the frogs become black, but recover their green color when a green branch is introduced into the vessel containing them. Those caterpillars living among pine needles are green, striped with white, yellow, and red, exactly harmonizing with the red and yellow or white portions of each needle; this seems due to the direct reflection of different shades of light on the moist skin of the caterpillar. In other caterpillars the longitudinal lines are broken up into spots, and if the process is carried on farther the spotting becomes transverse. Eyelike spots on certain caterpillars have been observed to be gradually formed at successive molts from what were originally continuous lines or stripes. It thus appears that the wonderful variety of colors and markings in animals is primarily due to the direct result of the environment, bringing about different results in animals of different groups and exposed to different environments. (For coloration due to changes of temperature see *Seasonal Dimorphism* under DIMORPHISM.)

General Protective Resemblance.—Cases in illustration are the white animals of the Arctic regions, where extreme cold and dryness have turned the hair of the polar bear, and the feathers of the snowy owl white. This applies to species, the individual ptarmigan, ermine, hare, fox, etc., turn white in winter, but of a russet hue in summer, due to the differing light reflected from the ground in summer and the snow in winter. The ptarmigan, grouse, prairie chicken, and the like, which build open nests, are protectively colored, while the conspicuously marked kingfisher, parrot, etc., build a nest which conceals the sitting bird.

The under side of the wings of certain butterflies, such as the species of *Polygonia*, *Suwanessa antiopa*, and the East Indian *Vallima* are assimilated in color, together with their often ragged outlines, to dead and tattered leaves; when the butterfly is resting on the ground or in bushes among the dead leaves, it is difficult to distinguish. On the other hand the upper side of the wings are conspicuously marked with reddish hues and conspicuous bars. Certain moths, when resting on the lichen-covered bark of trees, are wonderfully similar

to the surroundings, and are thus protected from the attacks of birds or lizards. In the Arctic regions and in Labrador certain butterflies and moths are of the color of lichen-covered rocks, so much so that when at rest they are difficult to detect.

Special Protective Resemblances.—The most striking examples are the measuring-worms, or geometrid caterpillars, which, when holding themselves out straight and stiff, resemble twigs, not only in shape, but in color and markings; and still more wonderful are those species whose bodies are provided with tubercles which in shape resemble the leaf-bud and other excrescences in the back of the twigs. How to account for the origin of such protuberances is a puzzle. The stick-insect is another example; though not common with us, and supposed to be well protected from the bills of birds, yet in the East Indian archipelago they are said to be the principal food of one kind of bird. Another example is the famous leaf-insect (*phyllium*) of Java, in which the wings are very broad, thin, and marked with veins like the mid-rib and side-ribs of a leaf.

Alluring Resemblances.—Such are the tentacles of the angler-fish or goose-fish, which, buried in the mud, waves its tentacles so as to deceive small fish. An Asiatic lizard (*phrynocephalus mystaceus*) is colored like sand, but is furnished with a red fold of skin at each angle of the mouth, which, says Marshall, is produced into a flower-like shape resembling a little red flower which grows in the sand. An Indian mantis (*Hymenopus bicornis*) devours insects which are attracted by its flower-like shape and pink color, which are like an orchid, the shape being due to the flattening of the tarsal joints of the legs, which radiate from the body like the petals of a flower.

Recognition Marks.—By Naller and others the stripes of the African antelopes, the upturned white tail of the rabbit and hare, and the bars and other conspicuous markings of birds that fly in flocks, are regarded as recognition marks, but others consider that this is rather fanciful and that they are protective alone.

Warning Colors.—Certain animals, of which the skunk affords an example, are so marked as to be easily distinguished by their enemies, which knowing by experience their offensive nature, pass them by. Hence the conspicuous stripes of the different species of these animals in the New World. There are many cases of brightly colored caterpillars which are avoided by birds and lizards which greedily devour green ones. The conspicuous red, blue, and purple spots and stripes are advertisement of their inedibility. In Nicaragua Belt observed that while ducks and fowl fed on ordinary green frogs, a small species gorgeously colored with red and blue, was avoided. On offering one to ducks and fowl they all refused to eat it, except one young duck, which took the frog in its mouth, only to drop it, going about jerking its head as if the taste of the frog was unpleasant. Although these striking markings are supposed to be the result of natural selection, Eisig's theory that the abundant secretion of pigment is the cause of the distastefulness, seems better grounded. Indeed a large number of cases of protective mimicry seem due to the direct action of light and warmth in

COLORIMETER — COLORING MATTERS

bringing about the varied hues of the pigment—moreover the range of primary colors is not very great, and the hues are apparently due to the action of the environment, so that we need not, in most cases at least, invoke the somewhat fanciful hypothesis of Wallace, Poulton, and others to account for these resemblances. As Eisig claims, the abundant secretion of pigment has caused the insects to be inedible, rather than that the bad taste has caused the production of bright colors as an advertisement or warning signal.

Color Preference.—It has been frequently noticed that house-flies will light on a dark dress in preference to a light one. They will settle down upon a dark red or brown dress in great numbers, and either avoid or rarely alight upon a pearl gray, lavender, or light or white dress or clothing of any kind. It is the same with the mosquito, which has the same color preference as the fly. In malarious countries this is a most important matter. The wearing of light yellow, drab, or white garments is an important means of protection against malaria. Houses in such regions should have light-colored walls to the rooms, especially in sleeping-apartments.

On the other hand, locusts are attracted by white or light-colored garments more than those of any other hue. White butterflies (*Pieris*) show a preference for white flowers; while in several cases yellow butterflies (*Colias, etc.*) prefer to visit yellow to white flowers.

Insects Attracted Rather by the Odors of Flowers than their Colors.—It has been argued by Lubbock and others that the colors of flowers attract insects, and that the gay lines and stripes leading down to the bottom of deep corollas are guides to the nectar. At present this view has been stoutly opposed by Plateau, after many observations, who thinks that the color of flowers has no connection with the visits of insects, but that they are attracted by the odor of the nectar. He finds that any flower is freely visited if it be nectariferous, no matter how colorless or inconspicuous it may be. Many gay flowers are wholly avoided by insects, but on placing nectar at the base of such flowers, insects were at once attracted. It appears from Plateau's observations that color is not a primary factor in attracting insects to flowers. Though bright blossoms are undoubtedly seen by insects from a distance, when they once reach the flowers it is a matter of indifference to them what their color is—blue, red, yellow, green, or white—if they differ from one another in no other respect. Consult: Wallace, 'Darwinism,' (New York 1889); Poulton, 'The Colors of Animals' (New York 1890); Beddard, 'Animal Coloration' (New York 1895); Newbigin, 'Color in Nature' (London 1898); also the writings of Lubbock, Plateau, Coste, Urech, Eimer, Hopkins, Weismann, Tenneck.

Colorimeter, kŭl''ō-rĭm'ē-tēr, an instrument for measuring the depth of color in a liquid by comparison with a standard liquid. In its usual form it consists of two long, narrow glass tubes placed side by side on a stand. The standard liquid and the one in question are poured in equal quantities, one into each tube; and water is then added to the darker till its tint becomes the same as the other. The

amount of water used is a measure of the depth of color in the given liquid.

Coloring, one of the essential parts of painting—namely, that part which relates to colors. Besides a knowledge of the art of preparing and mixing colors, and the whole mechanical process from the beginning to the finishing of a picture, which in the various kinds of painting varies according to the materials of each, coloring comprehends the knowledge of the laws of light and colors, and all the rules deducible from the observation of their effects in nature, for the use of the artist. This subject has been treated by Leonardo da Vinci in his work on painting; Lomazzo and Gérard Lairesse in books on the same subject; Mengs in his 'Praktischer Unterricht'; Goethe in his 'Farbenlehre'; etc. The skill of the painter presupposes a natural ability founded on superior sensibility—namely, the ability to image forth, and in the imitation to express with characteristic truth the peculiar substances and color of any object under the influences of the light and air. To make this imitation successful, an accurate attention to the local tones and tints is requisite. By local tones we understand the natural color of an object as it appears on the spot where it stands, or from the spot where the spectator is supposed to be stationed. In works of art the natural color of an object appears always as a local tone, because every object must be regarded from only one point of view, conformably to which the natural color is modified according to the supposed distance. By tints we understand, in a more restricted sense, the gradations of the clear and obscure which lights and shadows produce on the colored surface. In no object of art do these modifications and shades exist in greater delicacy and diversity than in the naked human body, which is consequently the most difficult subject for a painter. Coloring, in as far as it is an imitation of the color and character of flesh (the naked body), is called carnation (q.v.). If, in addition to the accurate coincidence of the natural colors, local tones, and tints of a painting with its original, the artist hits the expression of the peculiar character of the substance of which the object consists, the coloring is called true. But to truth should be joined beauty, which is attained by the harmonious union of all the tones of the painting into one leading tone. The coloring must conform to and promote the object of the painting as a work of art, and by the harmony of the colors and lights, as well as by the truth of the local colors, and of the individual parts of the subject, constitute one beautiful whole. In the choice of lights and the distribution of colors the artist should aim not only at clearness of representation, but at the same time at the production of a pleasing harmony, which should aid the general impression of the piece. Consequently harmony and chiaroscuro are comprehended in the idea of correct, beautiful coloring. We often see pictures in which the colors are true to nature, but which have little merit and are deficient in a harmonious union of excellences.

Coloring Matters. This name ought to include every substance, organic or inorganic, which is the cause of color in another, but in practice it is restricted to the natural coloring

COLORING MATTERS

matters of vegetables and animals, and to the dyes that are used for coloring fabrics. The reason of this restriction probably is that these coloring matters are distinctly different from the tissues or fluids which contain them, whereas the color of a mineral is not in general due to an isolable body, but is peculiar to the mineral itself. It is impossible, for instance, to take away the blue color of a copper compound, or the green or yellow of one of chromium. In the mineral world the analogy to the coloring of plants is found rather in rocks; for example, in a sandstone colored with oxide of iron, where the coloring matter may be removed without the rock mass being destroyed.

The organic coloring matters derived from vegetables are both important from their uses in the arts and interesting from their character and decompositions. They may be divided into two classes, those which exist ready formed in the plant, and those which are obtained by the spontaneous or artificial decomposition of some principle in the plant. Of those belonging to the first class, chlorophyll, the green coloring matter of the leaves, and the different colors in the flowers, are the most obvious. Those, however, which are used in the arts are not at first sight apparent, being contained in the seed, bark, stem, or roots, from which they can be extracted by water, alcohol, ether, dilute alkalies, etc. The second class includes bodies which result by oxidation or other chemical change from some usually colorless matters, to which the name "chromogens", color-producers, has been given; the question having been raised whether all coloring matters, even in plants, have not been produced from prior chromogens. The coloring matters have been subjected to investigation by numerous chemists, but, notwithstanding, very little is known about their real constitution. It is certain that many of the crude colors of commerce are mixtures, and it is highly probable that, when better known, their constituent principles will turn out to be diverse in constitution. Coloring matters are generally odorless, with a rough taste, soluble, some in water, others in alcohol. Indigo and alizarine can be sublimed, but most are decomposed by a slight elevation of temperature. They all consist of carbon, hydrogen, and oxygen, to which in some cases nitrogen is added. Some exhibit a weak acid tendency, combining with the oxides of lead, copper, and especially tin, iron, and aluminum, and forming insoluble colored compounds called "lakes." Some have the power of attaching themselves permanently to different vegetable and animal fibres, as silk, wool, cotton, and linen; others are unable to give a color which will not redissolve in water: in such cases the fibre is mordanted, that is, treated with one of the metallic oxides just mentioned, and then, when immersed in the color, the lake is precipitated in the fibre. The coloring matters are liable to change by exposure to daylight; they are also affected by a number of chemical reagents—certain blues, for example, are turned green by alkalies, and red by acids; they are destroyed by nitric acid, bleached by chlorine, decolorized, but not always permanently destroyed, by sulphurous acid, sulphuretted hydrogen, etc.

Of the coloring matters the yellows are the most abundant, and different varieties are got

from different plants: fustic, turmeric, quercitron, Persian berries, morindin, saffron, arnotto, purree, chrysophanic acid, and others; of the blues, indigo and litmus are the most familiar; and of the reds and purples, madder, logwood, Brazil-wood, safflower, and a few more. Most of these colors require complicated operations to separate them in the pure state.

The only green coloring matter known, of no importance as a dye, but indispensable to the life of the plant, is chlorophyll. It was formerly supposed that this is a single substance which could be obtained from an alcoholic extract of leaves by adding lime, then decomposing the lime-chlorophyll compound with an acid, and agitating with ether, from which the chlorophyll was got by evaporation. But by another process it was found that it could be separated into two bodies, one yellow, the other blue; and by the application of the spectroscope, Stokes showed that chlorophyll contains four coloring matters, two yellow and two green, differing in optical properties. By further study in the same direction Mr. Sorby thinks he has proved that besides the greens there are four or five distinct yellow coloring matters, to which he has given special names. It is quite obvious, if this be so, that our knowledge of the nature of chlorophyll is just beginning, for each coloring matter will become an object of chemical and physiological investigation, and not till then will it be possible to say how chlorophyll acts in a plant. Experiments have been recently tried to elucidate more precisely the fading of chlorophyll when exposed to light, a change which is accompanied by altered spectrum bands, but in their present state they are too incomplete for description here.

The chief animal coloring matters are those of the blood, the bile, the urine, the retina, of the muscle and of the skin. The blood's coloring matter is the well-known hemoglobin, while the pigments of the bile, bilimbim, and its oxidation product, biliverdin, are derived from the blood pigments. Biliprasin and fuscine, bilicyanin, bilipurpurin, and bilixanthin, are other bile pigments. They may be regarded as various products of oxidation and reduction of the initial bile pigments. Urochrome is the general name applied to the urinary pigments. Its exact composition is by no means definitely understood. In the retina there are a number of pigments or chromophenes. They are mostly lipochromes, or fatty pigments, and have been named rhodophane, chlorophane, and xanthophane, these being red, green, and yellow respectively. There is a further black pigment in the eye, fuscine, allied to the melanins of the skin and hair. The muscle pigments are identical with the blood pigments. The skin pigments belong to a group known as the melanins. It is questioned whether these are iron pigments or not.

The artificial coloring matters may be divided into two classes, those which exist ready formed in nature, as many of the common red and brown paints, or which are formed by the mechanical mixture of such naturally existing colors, and those which do not exist in nature, but are produced by chemical operations. The latter are of mineral or of organic origin, examples of the first class being afforded by

COLORS — COLOSSUS

Scheele's, Guignet's and other greens, artificial ultramarine, smalt, and many others, and of the latter by Prussian blue, and especially by the aniline colors. The artificial colors will be more particularly described in the articles DYEING and PIGMENTS; COAL-TAR COLORS.

Colors, in the army, the flags carried by each regiment. Each British regiment carries two colors, the royal or first color, and the regimental or second color; neither of these is now carried into battle. Each United States regiment carries the national color and the regimental color, the latter bearing the regiment's number; both are carried into action. In the navy the term colors is applied only to the national flag.

Colors. See COAL-TAR COLORS.

Colors of Thin Plates. See INTERFERENCE.

Colossæ, kō-lōs'ē, an ancient city in Phrygia, situated on the Lycus, a branch of the Mæander. Colossæ had disappeared by the Middle Ages, and it is uncertain whether it was superseded by the town of Chonæ in its neighborhood, or whether Chonæ was Colossæ with only a change of name. It was first mentioned by Herodotus, Xerxes passed through it on his march to Sardis, 481 B.C., and it was a place of considerable mercantile importance in the time of Strabo. One of Paul's epistles was addressed to the Colossians, from which it is known that Colossæ was the site of one of the early Christian churches.

Colossal Cavern, The. A large cave discovered in 1895, the entrance to which is about one and a half miles distant from the entrance to the Mammoth Cave, of Kentucky. It was not explored to any great extent until 1898, nor has it yet been thoroughly explored; and no scientific investigation was made of the interior until 1903. On account of its immense size and the varied character of its formations, which are preserved in all their pristine beauty, the Colossal Cavern is a most worthy rival of the Mammoth Cave. The Louisville & Nashville Railroad Company purchased the Cavern in 1896. As exploration was pushed in various directions, the company acquired the land under which its course was found to run, and large sums have been expended in widening narrow passageways, smoothing rough places, building stairways where desirable for comfort, and doing many other things to make exploration easy. There are four separate entrances to the Cavern, only one of which (an artificial entrance) is used by visitors, and over 14,000 linear feet in distance have been surveyed. Among the many attractions of the Cavern are, Colossal Dome, 135 feet high, which is the most symmetrical as well as one of the largest domes known; Vaughn's Dome, 78 feet in height, which is approached through a magnificent canyon, about 300 feet in length; the Twin Pits, 65 feet deep; the Lover's Gallery, 400 feet long; the Ruins of Carthage, 400 feet long and 100 feet wide; Pearly Pool; Pulpit Rock; Dining Room, etc. Taken as a whole, Colossal Cavern presents to lovers of subterranean beauty and grandeur, a field which is perhaps unequalled by any other known cavern. The Cavern is readily and comfortably accessible by wagon from the terminus of the Mammoth Cave R.R.

HORACE C. HOVEY.

Colosseum. See COLISEUM.

Colossians, kō-lōsh'ī-anz, **Epistle to the**, accredited to Paul the Apostle, written to the faithful of Colossæ, a city of Phrygia, near Laodicea. The epistle does not show that Paul had been in Colossæ or that he had, by word of mouth, preached the doctrines of Jesus Christ to the people of that city. There are good reasons to believe that Epaphras, a disciple of the apostles, preached to the Colossians and converted them. From the epistle itself (i. 7, 8,) it would seem that the disciple Epaphras was one of Paul's assistants, that he gave to this apostle accounts of his work, and that such accounts had been pleasing to Paul.

Some critics and commentators writing on this epistle, claim that it was written by Paul when he was in prison, in Rome (iv. 10), and that he wrote epistles, at the same time, to the Ephesians and Philippians. Others hold that the epistle to the faithful in Colossæ was written while he was in prison in Cæsarea.

The epistle contains a summary of Christian doctrine and practices, an arraignment of the sins of the time and the temptations by which the new-born Christians were beset, and a series of practical exhortations to the people of Colossæ in particular, but which are applicable to Christians in general. The epistle itself seems to show clearly that it was addressed to a body of Christians in union with all the other Christian Churches and bodies of the day. The sins and crimes which are mentioned indicate the time and locality where lived the people to whom the epistle was addressed.

A distinctive mark of the Christians was their method of prayer. They saluted each other in the name of Jesus Christ and expressed honor and respect for him, and thus made a prayer of the very beginning of their conversations, discourses, or writings (i. 2). They praised and adored God (i. 16-20), they petitioned Him and returned thanks for all things (i. 9, 12), and they offered the Lord Jesus Christ as atonement for all their wrong doings (i. 14, 21, 22). Several of the early Christian missionaries are mentioned; as Epaphras, Onesimus, Aristarchus, Mark, Barnabas, Luke, Demas, and Tychicus. The epistle must have been written in 62 or 63 A.D. The union among the Christians is shown by the remarks about the faithful in Laodicea and Hierapolis.

The faithful of Colossæ are warned lest any man cheat them or deceive them (ii. 8); they are told that Jesus Christ died for all (iii. 11), and they are given a code of morals and told their duty as Christians in general and as husbands, wives, children, masters, and servants.

Bibliography.—Köpper, Lightfoot, Ultramarine, 'Commentaire sur les épîtres de S. Paul aux Collossiens, aux Ephésiens et aux Philippiens'; Moffat, Fouard, 'Life of St. Paul.'

Colossus, kō-lōs'ūs, in sculpture, a statue of enormous magnitude, from which our adjective colossal is derived. The people of the East from the most ancient times have been celebrated for colossal sculpture. The pagodas of China and of India and the excavated caverns of the East abound with colossi of every description. The Asiatics, the Egyptians, and in particular, the Greeks, have excelled in these works. The celebrated colossus of Rhodes was reckoned one of the seven wonders of the world. It was raised by the Rhodians in honor of Apollo. Strabo, Pliny, and other ancient authors who

COLQUITT — COLUBRIDÆ

lived at the time that the colossus of Rhodes is said to have been in existence, have given its height at 70 cubits, or about 105 feet. Other authors who flourished since its destruction report its height at 80 cubits. The statue stood at the entrance of the harbor of Rhodes, but there is no authority for the statement that it bestrode the harbor mouth, and the Rhodian vessels could pass under its legs. Of other colossal statues of ancient times the most celebrated are the Olympian Zeus and the Athena of the Parthenon, both the work of Phidias. The virgin goddess was represented in a noble attitude, 26 cubits or 39 feet in height, erect, clothed in a tunic reaching to the feet. In her hand she brandished a spear, and at her feet lay her buckler and a dragon of admirable execution, supposed to represent Erichthonius. The statue of Zeus was 60 feet high. The earliest colossus recorded to have been sculptured in Rome was the statue of Jupiter Capitolinus, which Spurius Carvilius placed in the capitol after his victory over the Samnites.

Among modern works of this nature are the colossus of San Carlo Borromeo at Arona in the Milanese territory; the four colossal statues at Paris in front of the façade of the palace of the Chamber of Deputies, representing four of the greatest French legislators; and a statue of Germania, 34 feet high, on a pedestal over 81 feet high, erected near Rudesheim in commemoration of the unification of the German empire. In the United States a figure of "Liberty Enlightening the World," 151 feet high on a pedestal 155 feet high, has been erected in New York, overlooking the harbor and serving as a beacon. It was the work of the French sculptor Bartholdi, and was constructed mainly through the efforts of a French-American Union formed in 1874. In 1880 it was presented by France to the United States, and six years later it was placed on its present site, Bedloe's Island.

Col'quitt, Alfred Holt, American legislator: b. Walton County, Ga., 20 April 1824; d. Washington, D. C., 26 March 1894. He was graduated at the College of New Jersey in 1844, and settled in his native State as a lawyer. He served in the Mexican war, and was elected to Congress in 1852 as a Democrat. Upon the outbreak of the Civil War he entered the Confederate army as a captain. He was elected governor of Georgia in 1876 and United States senator in 1882 and in 1888.

Colquitt, Walter T., American lawyer: b. Halifax County, Va., 27 Dec. 1799; d. Macon, Ga., 7 May 1855. He was educated at Princeton, was admitted to the bar in 1820; became a district judge in 1826, holding the first court ever held in Columbus, Ga. He was a successful lawyer, and in criminal practice was without a rival in his State. He was a member of the Georgia State senate 1834, 1837; a representative in Congress 1839-43; a United States senator 1843-9; and a member of the Nashville Convention 1850.

Colt, Samuel, American inventor: b. Hartford, Conn., 19 July 1814; d. there 10 Jan. 1862. He had a common school education and was employed in his father's textile mill; but went to sea as a sailor when 15. His attention being drawn to firearms while at sea, he began to perfect a revolver and patented it in 1835. Its great success led to the erection by him at Hartford

of one of the most extensive weapon factories in the world.

Col'ton, Arthur Willis, American writer: b. Washington, Conn., 22 May 1868. He graduated at Yale 1890, held the Foote scholarship there 1890-3, and was instructor in English literature 1893-5. He has of late devoted himself to writing, and his stories have appeared in the 'Atlantic Monthly' (1899), 'Scribner's Magazine' (1899), and the 'Century' (1900). In book form he has published 'Bennie Ben Cree'; 'The Debatable Land' (1901); 'The Delectable Mountains' (1901); 'Tioba, and Other Tales' (1903); 'Belted Seas' (1905).

Colton, Charles Henry, American Roman Catholic prelate: b. New York, N. Y., 15 Oct. 1848. In the schools of that city he pursued his elementary studies, later attended the Latin school connected with Saint Stephen's Church, and in 1869 began a theological course at Saint Francis Xavier's College. After three years he repaired to Saint Joseph's Diocesan Seminary, Troy, N. Y., where he was ordained priest 10 June 1876. He was then made assistant pastor of Saint Stephen's Church, New York, and, in 1886, assumed charge of the Church of Our Lady of Mercy, Port Chester, N. Y. In 1887 he was recalled to New York to aid the Rev. A. J. Donnelly of Saint Stephen's. Father Colton was named administrator of the parish, and subsequently appointed rector. In 1896 Archbishop Corrigan appointed him chancellor of the New York diocese and upon Bishop Quigley's promotion to the archbishopric of Chicago, Ill., the Holy See chose Father Colton to succeed him as bishop of Buffalo. He was consecrated in New York by Archbishop Farley 24 Aug. 1903. According to the latest statistical report (1904) the diocese of Buffalo has a Catholic population of at least 197,000; 257 priests, 157 churches, 73 parochial schools, 2 seminaries, 5 orphan asylums, 2 hospitals; also other charitable and educational institutions.

Colton, Gardner Quincy, American scientist: b. Georgia, Vt., 7 Feb. 1814; d. Rotterdam, Holland, 11 Aug. 1898. He received a common school education and learned chair making, removing to New York in 1835, and taking up the study of medicine and science in 1842. Lecturing on chemistry and physics a few years later, accident led him to a discovery of the anæsthetic properties of nitrous oxide, or "laughing gas," credit for which is also given to Dr. Horace Wells. He perfected an electric motor in 1847, went to California in 1849, and resumed his scientific lectures in 1860.

Colton, Walter, American writer: b. Rutland, Vt., 9 May 1797; d. Philadelphia, Pa., 22 Jan. 1851. He became professor of moral philosophy and belles-lettres at Middletown Academy, Conn. (1825); in 1828-30 was editor of the 'American Spectator,' Washington. In 1845 he went to California, and in Monterey established the first newspaper of the State, called the Californian. He wrote several books of interest, including 'Visit to Athens and Constantinople' (1836), and 'Three Years in California' (1850); 'The Sea and Sailor' (1851).

Colūbridæ, kō-lū'brī-dē, a family of snakes, typified by the limited genus *Coluber* of Linnæus, and itself typical of the sub-order or super-family *Colubroidea* or *Colubrina*. As used

COLUGO — COLUMBÆ

by Cope the family contains non-venomous snakes only, but under Boulenger's system it embraces both the *Opisthoglypha* and *Proteroglypha*, which include the majority of poisonous snakes, especially those of the Old World, all, indeed, except the vipers and pit-vipers (qq.v.). Even in the limited sense, a vast majority of snakes, not less than 1,000 species, fall within the family. All are of relatively small size, only a few giants attaining a length of 10 feet and all have continuous rows of small teeth in both jaws, and none enlarged to serve as poison fangs. The head scales are large non-imbricate plates, but the body scales usually overlap, tile-like. They are oviparous or ovoviviparous, and feed on insects, small mammals, birds, etc., though a few, as the king-snake, habitually devour poisonous serpents. Most of them are terrestrial, but some are aquatic and others arboreal. Nearly cosmopolitan in their distribution, but very sensitive to the influence of cold, they are absent from the polar regions, and in temperate climes hibernate during the winter. Many species are found in North America. (See BLACK-SNAKE; CORNSNAKE; GARTERSNAKE; PINE-SNAKE; WATERSNAKE; etc.) Consult: Cope, 'Scaled Reptiles of North America'; Boulenger, 'Catalogue of Snakes of the British Museum,' where full references will be found.

Col'ugo, kō-loo'go, **Cobego**, kō-bā'gō, or **Kaguan**, kā'gwän, an East Indian insectivore of the typical genus of the family *Galeopithecidae*, as yet imperfectly known. It is a slender creature about 18 inches long, its body covered with peculiarly sleek fur, and provided with a parachute of membrane furred on both sides, and extending from the neck nearly to the tip of the tail, by which it is enabled to make long sailing leaps like a flying-squirrel, a feature which gives it its technical name, *Galeopithecus volitans*. Like the bat, which the colugo resembles in various actions, it is a creature of twilight, hanging suspended by its hind legs, from branches during the glare of day, and seldom venturing forth in the complete darkness of night. It feeds upon leaves, fruit, and insects. Consult: Moseley, 'Notes by a Naturalist on H. M. S. Challenger'; Wallace, 'Malay Archipelago.'

Columba, kō-lūm'ba, **Saint**, apostle of the Northern Picts of Caledonia and founder of numerous monasteries in the Hebrides and the Scottish mainland: b. 7 Dec. 521 in the territory of the Kinel-Conal, modern Donegal. He was a scion of the illustrious race of Conal, and was thus of kin to the northern princes of Ireland and of the Gaelic princes of Scotland. Whether his name, or surname, Columba, is Latin or a Latin modification of a Gaelic name cannot be determined; it appears also in the form Colm (whence the name Malcolm, servant or devotee of Columba); and the saint is also known as Columkillé (Columba of the churches, or *cellae*, the c in Gaelic being equal to k), because of the great number of churches and monasteries he founded both in Ireland and in Scotland and the isles. He became a monk in his youth in the monastery of Moville in Donegal, and at the age of 30 was a priest. Among the monastic establishments founded by him in Ireland are those of Daire-Calgaich (Calgach's oak grove), the site of the famous city of Derry or Londonderry; and Dair-mach

(oak of the plain) where now is Darrow. This was the greatest of all his Irish monasteries. It is worthy of note that after his migration to Scotland, he and his immediate successors in Iona exercised jurisdiction over these Irish monasteries. About the year 563, being then under excommunication for the part he had taken in the bloody battle of Cooldrevny, he set sail for North Britain with a band of his monks to preach the Christian religion to the still pagan Picts of northern Caledonia. He was entertained hospitably by his kinsman, Conal, king of the Scots in Argyll (Airer-Gædhill, land of the Gæl) who gave him for his residence the island in the Hebrides later called I, or Iona and I-Columkillé. Having established in Iona a monastery and training-school of missionaries, he crossed over to the country of the northern Picts—the southern Picts had already been converted to Christianity—and to them preached the gospel with such effect that their king Brude and the whole people embraced the faith. Before Columba's death all northern Caledonia was Christian and monasteries were very numerous whether on the mainland or in the islands. Iona was the mother house, and thence Columba and his successors, abbots of Iona, governed not only the monastic houses but the churches also; and though there were bishops for the special functions of the episcopate—the ordering of priests, for example, the administering of confirmation, the consecrating of churches, and the like—those bishops were subject to the authority of the abbot of Iona, though he was never more than a presbyter in ecclesiastical order. What time was at his disposal amid the many cares of his station, Columba devoted to study and to transcription of the Scriptures. On 8 June 597 he was employed in this labor, transcribing the psalm *Benedicamus Domino* (the 33d in the Septuagint and the Vulgate, but the 34th in the authorized English version); after penning the words "Inquirentes autem Dominum non minuentur omni bono"—they who seek the Lord shall want no manner of thing that is good. "Here," he said, "I must stop; what follows let Baithen write," and laid down the pen. At the midnight hour he was in choir for the office of Matins, having come to the church unaided and knelt at the altar; through sleep he in a few moments passed to death.

Columba, or **Columba Noachi**, nō-ā'kī (Lat. "Noah's dove"), a small constellation of stars south of Lepus and Canis Major, about the time of whose discovery there are different statements. It is generally believed that it was first named by Royer in 1679 or 1680. This is easily disproved by the fact, seldom noted, that Bayer in his 'Uranometria,' published in 1603, on the 37th map, just below Canis Major, pictures the dove flying with the olive-branch in its mouth. Dr. Gould states that it was mentioned by Petrus Plancius, an eminent Dutch geographer and teacher of Petrus Theodori. The latter died in 1596. The constellation is known to-day by the simple name of Columba, and is situated between Puppis, Pictor, Cælum, Lepus, and Canis Major.

Columbæ, kō-lūm'bē, an order of birds, also when somewhat extended, called *Pullastræ*, placed next to the *Gallinæ* near the summit of the series of schizognathous birds. It contains

COLUMBANUS — COLUMBIA

the various kinds of doves and pigeons. The order is not clearly circumscribed, but all typical forms may be distinguished from the *Galina*, with which they have most in common, by the tumid membrane or cere into which the nostrils open at the base of the beak, and by their feet. Their toes are four, namely, three before and one behind, the former not or very slightly united toward their base by a membrane; the hallux is well developed and on the same level as the other toes. The species are monogamous, and pair for life; lay generally but two eggs for a brood, but breed often, and feed their young with macerated food from their own crops. The young at birth are helpless and naked. Upward of 500 species of pigeons have been described from all parts of the world, including many strange forms. Three sub-orders, the *Didi*, *Pterocletes*, and *Peristeræ* are recognized. The first includes only the extinct dodo, family *Dididæ*; the second the *Pteroclidæ*, or sand-grouse, so called, of Asia and Africa; the third the families *Didunculidæ*, or tooth-billed pigeon, of the Samoan Islands; *Tieronidæ*, or fruit-eating tree-pigeons of the Australian and Malayan regions; *Calenadidæ*, or bony-gizzard pigeon of the Indian Archipelago; *Gouridæ*, or crowned pigeons of New Guinea; and finally the *Columbidæ* or true pigeons and doves, cosmopolitan group, and the only family represented in North America. Consult: Salvadori, 'Catalogue of Pigeons of the British Museum.'

Columbanus, kōl-ūm-bā'nūs, missionary and founder of a monastic order, that of the Columban monks, was born in Ireland about 545; died in his monastery of Bobbio, in the Apennines, Italy, 21 Nov. 615. The order founded by him, was for a while hardly inferior to the order of St. Benedict in number of monasteries or in the services it rendered to the Church. He was an alumnus of the great monastery of Benchor or Bangor, in Ulster, and thence in his 45th year he went to France as a missionary, accompanied by 12 young disciples. In France he founded the monasteries of Luxeuil and Fontenay, giving to the monks a rule identical with that of the Celtic monasteries of Ireland. He gave offense to the French bishops by the fashion of his tonsure and by his observance of Easter in accordance with the calculation of the eastern churches. And his apostolic outspokenness in rebuking the vices of the Burgundian court, the king (Thierry II.) and the queen mother (Brunehaut) led to his expulsion from that country. He now decided to cross the Alps and labor as a missionary in Italy. On his route thither he tarried a while among the Swiss, preaching the gospel on the shore of Lake Constance. One of his 12 companions, named Gallus, falling sick, was left behind when the missionary party resumed their travel: this Gallus afterward laid the foundations in Switzerland of a monastic institute which later was called by his name, St. Gall (Sankt Gallen) and which was one of the notable centres of monasticism in Europe. Columbanus, in 612, founded the great monastery of Bobbio in the Apennines, giving to the monks of that house, which soon was recognized as the mother-house of a multitude of abbeys and monasteries, a rule of great austerity. The keynote of it is implicit, unquestioning

obedience in all things to the abbot or superior. It prescribes perpetual silence save where speech is absolutely necessary. The use of animal food of all sorts is interdicted. The monks are allowed one meal daily, taken at eventide, and it consists of vegetables and bread. The monks of his monasteries, called Columbans, came under the Benedictine rule in the 8th century and the Columban order was merged in the Benedictine. Columbanus was a man of learning, acquainted not only with the Latin language current in his time, but with the classic Latin authors, as also with the Hebrew and Greek languages. He left a few writings, all in Latin; they have all been published more than once. They comprise his Monastic Rule (*Regula Cœnobialis*); a few poems of considerable merit; 16 brief sermons, and several letters of value for ecclesiastical history. A town in Lombardy, San Colombiano, perpetuates the memory of this Celtic missionary to Italy.

Colum'bia, the popular name of the United States; derived from Columbus, and applied to the greatest nation of the New World from a feeling of poetic justice to the memory of its great discoverer.

Columbia, British. See BRITISH COLUMBIA.

Columbia, District of. See DISTRICT OF COLUMBIA.

Columbia, Mo., a city and county-seat of Boone County, situated 10 miles north of the Missouri River, on the Wabash R.R. It was first settled in 1815 by Kentuckians and is governed by a mayor and a council of eight members, who are elected semi-annually. The city has four banks with a combined capital of \$370,000. Columbia has many public and educational institutions, including Missouri University, Missouri State Farm and Experiment Station, Parker Memorial Hospital, Stephens Baptist College for Women, Christian College for Women, Columbia Normal Academy, Columbia Business College, University Military Academy, and High School. Pop. (1904) 6,000.

Columbia, Pa., borough, in Lancaster County; on the Susquehanna River, and on the Pennsylvania and the Philadelphia & Reading R.R.'s; about 26 miles southeast of Harrisburg. The place, originally called Wright's Ferry, was founded in 1726 by Quakers from Chester County. Columbia was one of the places proposed, in 1789, for the capital of the United States. The bridge, which connected Columbia with Wrightsville, was burned in 1863, to prevent the Confederate forces from proceeding to Philadelphia. A fine bridge has taken the place of the old one. Columbia is an industrial and trade centre of considerable importance. The chief manufactures are foundry and machine-shop products, boilers and engines, flour, beer, wagons, shirts, silk, lace, and lumber. Pop. (1890) 10,199; (1900) 12,316.

Columbia, S. C., the State capital, and county-seat of Richland County, situated in the centre of the State, on the east bank of the Congaree River, at the head of navigation, two miles below the junction of the Broad and Saluda. It is on the Atlantic Coast Line, the Seaboard Air Line, the Southern, and the Columbia, N. & L. R.R.'s, 129 miles northwest

COLUMBIA

of Charleston, 82 miles northeast of Augusta, Ga., and 153 miles north of Savannah.

Columbia is one of the handsomest cities of its size in the country, and in a district noted for sanitariums. It is built on a sand-hill plateau which forms a bluff 100 feet high at the river, and sloping away on all sides, giving excellent drainage. The streets which are 100 feet wide are at right angles to each other, and there are four avenues 150 feet wide radiating from the capitol. All the chief streets are boulevards, with handsome shade-trees not only along the sides but in the centre. There is also a fine park. The business buildings are rapidly increasing in size and architectural beauty. The granite State-house, costing \$4,000,000 and modeled on the capitol at Washington, is one of the most imposing in the South and one of the handsomest in the country. Spacious grounds surround the capitol, and among the city's attractions are the monuments, which include a "Palmetto Tree" in bronze. The executive mansion, the government building, the county court-house, the city hall, the State insane asylum and State penitentiary are also noteworthy. The city is rich for its size in important educational institutions: South Carolina College, founded 1801; the Presbyterian Theological Seminary, also very old; Columbia Female College (Methodist Episcopal Church South), founded 1859; Allen University (African Methodist Episcopal), 1881; the College for Women (Presbyterian) 1890; and Benedict College (colored). It has also a well-attended public-school system, and two high schools.

Municipal Conditions.—The principal streets are asphalt; the roads are chiefly of sand and clay and are excellent. The city owns its waterworks, and has gas, electric light and power, and an electric railway system. The government is by the revised charter of 1894, with a two-years' mayor, and a council which has nearly all the appointing power.

Business Interests.—The city affords one of the most remarkable instances of manufacturing development in the country. It is in the heart of a fertile cotton district, and near forests of pine, oak, walnut, and maple; but its site is the key to an important future. A rocky shelf projecting for four miles from the junction of the Broad and Saluda forms the bed of the Congaree, 500 feet wide, which plunges down it in rapids, affording immense power, which is made available by a canal $2\frac{7}{8}$ miles long, 110 feet wide at bottom and 150 at top, with 31 feet fall, furnishing 14,000 horse-power, and operating dynamos which create electricity for manufacturing power, light, and street railways. But the greatest establishments are independent of this except as a resource, using steam dynamos,—for all Columbia's industries are run by electricity. In 1892, there was one cotton mill in the city employing 125 men. Now the great Whaley system of cotton mills includes four in Columbia, with 197,000 spindles, 4,840 looms, and \$3,100,000 invested capital. The Olympia mill, with nine to ten acres of floor space, and over 100,000 spindles, is the largest in the world operating under one roof; the Granby and Richland are also large and well-equipped mills; and the three, owned by one company and employing almost 3,000 hands, are the nucleus of a large village of 500 acres owned

by the company, with sewerage, fire department, electric street lighting, cottages wired and plumbed, churches, schools, etc. The Columbia Mills Company is also a great organization, capitalized at \$1,500,000, and turning out over 20,000 bales of cotton duck a year. Besides this predominant industry, there are growing hosiery works, glass works which utilize the fine sand found nearby, four quarries of fine granite, large lumber works starting up, and small miscellaneous industries. The vast beds of kaolin in the vicinity now supply outside potteries, but local works are contemplated. The rock ledge before mentioned extends two miles below the city with only four feet of water over it, dropping off to ten feet or more at Granby. Deep water is now to be brought up to Columbia, not by dredging, but by a floating dam 15 feet high, costing \$250,000, which will enable vessels of ten feet draft to come up to the city, instead of unloading and trucking up from Granby as heretofore. Two steel steamers run from Granby to Georgetown, which will start from Columbia when the dam is completed, and ultimately go to Charleston. This improvement makes Columbia the great distributing point for central and northern South Carolina.

History.—The town was settled about 1700, but remained farm land till 1786, when the people of the State demanded a capital more centrally located than Charleston, and Columbia village was laid out. The legislature first met there in 1790. In the Civil War it shared the general fortunes of the State, till Sherman's army entered it 17 Feb. 1865. The following night a fire broke out which lasted all the next day and laid over half the city in ashes, including a number of business blocks, private residences, schools, the railroad station, several churches, and a convent, and destroyed a great quantity of cotton. Its development since is part of the general industrial awakening of the South. Pop. (1860) 8,052; (1870) 9,298; (1880) 10,036; (1890) 15,353; (1900) 21,108, of which 11,244 were white. Several mill villages, chiefly that of the Whaley mills, with several thousand inhabitants, are outside the old city limits though close by, and 35,000 is a reasonable estimate of the population including these suburbs.

Columbia, Tenn., county-seat of Maury County, situated on the Duck River, and on the Louisville & N. and the Nashville, C. & St. L. R.R.'s. It is the trade centre of a fertile agricultural region, and has a stock yard, a grain elevator, and cotton and flouring mills. It is the seat of Jackson College and two seminaries for young women. It also has a United States arsenal. Pop. (1900) 6,052.

Columbia City, Ind., the county-seat of Whitley County, in the northeastern part of the State, situated on Blue Creek and on the Wabash and on the Pittsburg, Ft. W. & Ch. R.R.'s. It has lumber mills and a few other manufacturing interests. Pop. (1900) 2,975.

Columbia or Oregon River, after the Yukon the largest river on the western side of America; it rises in British Columbia, on the west slope of the Rocky Mountains, near Mounts Brown and Hooker, in about lat. 50° N.; has a very irregular course, generally southwest through Washington; forms the northern boundary of Oregon for about 350 miles; and enters

COLUMBIA SALMON — COLUMBIA UNIVERSITY

the Pacific by an estuary 35 miles long and from three to seven wide. Its estimated length is 1,400 miles. The area drained by this stream and its tributaries, of which the largest are Clarke's Fork and the Snake River (with very remarkable cañons), has been computed at 298,000 square miles. The river is broken by falls and rapids into separate portions, and formerly a bar across its mouth obstructed navigation. The construction of a jetty has provided a good harbor; and in Nov. 1896 the Government completed a canal and locks at the Cascades, at an expense of nearly \$4,000,000, and navigation is (1904) open to The Dalles. The Government is about to begin work to overcome the obstructions at The Dalles. The Columbia and its branches have 2,132 miles of navigable waters. The extraordinarily abundant salmon-fisheries have been largely developed. There are a number of canneries near the mouth of the river; the annual export of canned salmon exceeds 500,000 cans. Captain Gray of Boston was the first modern navigator to enter the river in 1792; and it was explored in 1805 by Lewis and Clark.

Columbia Salmon. See QUINNAT.

Columbia University, a seat of learning in New York. The design of establishing a college in New York was more than 50 years in contemplation before it was carried into effect. In 1746 provision was made by law for raising money by public lotteries. Five years later the proceeds of these lotteries amounted to about \$1,700 and were given to trustees. The fact that two thirds of these trustees were in communion with the Church of England, and that some of them were vestrymen of Trinity Church excited opposition to the proposal as a scheme to strengthen the Established Church and delayed the procurement of a royal charter. Friends of the enterprise proceeded, however, with the arrangement for opening the college and elected for their first president the Rev. Dr. Samuel Johnson, of Stratford, Conn., who assumed the office 17 July 1754, in the school house belonging to Trinity Church. There was a class of eight students.

The cosmopolitan character of the governing body of the college is due to its charter. To meet the objections that had been made, it was so drawn as to include in its board of governors, besides other ex-officio representatives, not only the rector of Trinity Church, but the senior minister of the Reformed Protestant Dutch, Ancient Lutheran, French, and Presbyterian churches. It is probably due to this circumstance that Columbia almost alone of all the pre-Revolutionary colleges in the United States has never had a theological faculty connected with it. The trustees, at present, are members of the Episcopal Church, and also of the Reformed, Presbyterian, and Roman Catholic churches, showing that this cosmopolitan character has never been lost. A prominent Hebrew rabbi was at one time a member of its councils.

The charter of King's College, the original name of Columbia, was granted by George II., and finally passed the seals on 31 Oct. 1754, from which day the college dates its existence. It received from Trinity Church, according to

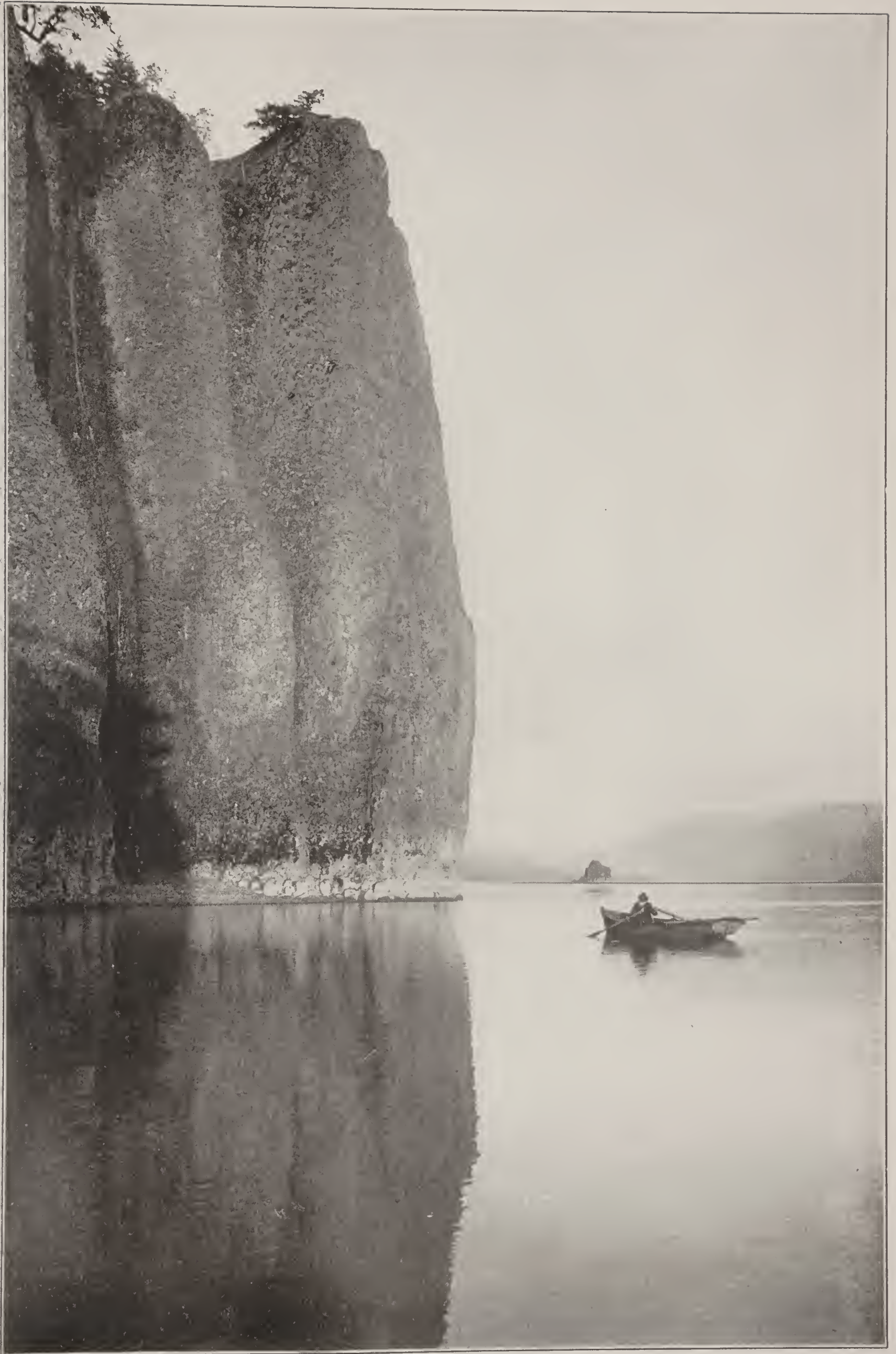
a promise previously given, a portion of a grant of land known as "the King's Farm," upon the site of which its first building was erected. It was stipulated in the royal charter that its president should be a communicant of the Episcopal Church and that proper selections from the liturgy of that Church should be used in the religious services of the college. This caused much angry controversy, and after the Revolution it was stricken out of the charter, but remains as the condition of the deed of gift from Trinity Church. King's College played a conspicuous part in securing and confirming the independence of the United States. The Revolutionary War caused a suspension of the activities of the college, and in 1776 the college building was used as a military hospital. After eight years the college work was resumed by act of the legislature, 1 May 1784, under the name of Columbia College.

On 13 April 1787 the legislature revived the original charter with amendments, which abolished ex-officio membership of its governing body, canceled the requirement that the president should hold a certain form of religious belief or that a certain form of prayer should be used in the services of the college, and named a body of 29 trustees, which, when reduced to 24 members, was made a self-perpetuating body, under which government the college has remained. The medical faculty was organized in 1792 and a professorship of law was established in 1793.

The original site of the college was in what became later the block bounded by College Place, Barclay, Church, and Murray streets. In 1857 the college was moved to 49th and 50th streets and Madison Avenue, where it remained until 1897. In 1892, for \$2,000,000, purchase was made of 17½ acres of land lying between 116th and 120th streets, Amsterdam Avenue, and the boulevard. Here in 1897 the college was reorganized on the basis of a university.

Columbia University, in a technical sense, consists of the faculty of law, the first professor of which (1792), James Kent, during the period of his second appointment in 1823 delivered the courses of lectures which developed into the first two volumes of his famous 'Commentaries'; the faculties of medicine; philosophy, political science; pure science; and applied science. The College of Physicians and Surgeons, the outcome of the medical faculty, established in King's College in 1767, became in June 1860, the Medical College of Columbia. In 1891 it surrendered its separate charter and became an integral part of Columbia College. A peculiarity of the Columbia organization is the system by which seniors in Columbia College, who have entered the college not later than the beginning of the junior year, are allowed to select part or all of the courses necessary for the bachelor's degree from among those designated by the university faculties, professional or non-professional, as open to them. The object of this arrangement is to shorten the time necessary to the attainment of the higher, particularly of the professional, degrees. The degree of master of laws is conferred for advanced work in law done under the faculties of law and political science together. The faculties of law, medicine, and applied science, conduct respectively the schools of law, medicine, and mines, chemistry, engineering, and architecture, to which

COLUMBIA RIVER.



COLUMBIA UNIVERSITY.



LIBRARY BUILDING.

COLUMBIAN COLLEGE—COLUMBINE

students are admitted as candidates for professional degrees on terms prescribed by the faculties concerned. The school of mines was due to the exertions of Thomas Egleston, who was made professor of mineralogy and metallurgy in 1864, and who opened the school of mines the same year in the basement of the old college building in 49th Street. There is also the school of chemistry, engineering, and architecture, set off from the school of mines in 1896. Out of the school of mines grew the school of pure science, established in 1892. Under President Barnard's influence, in April 1889, the trustees gave their official approval to the plan for founding Barnard College for women studying for Columbia degrees. It is financially a separate corporation, but educationally it is part of the system of the university. Teachers' College, a professional school for teachers, is also financially a separate corporation and educationally a part of the university. It was founded in 1888, chartered in 1889, and included in the university in 1898. (See COLLEGES FOR TEACHERS.) Some of these courses are accepted by Columbia University, and may be taken without extra charge, by students of the university in partial fulfilment of the requirements for the degrees of bachelor of arts, master of arts, and doctor of philosophy. In 1902-3 the university had a total of 5,134 students in all departments, and its library comprised 330,000 bound volumes. The new library building is a gift from ex-President Low, and cost over \$1,000,000.

The presidents of the University have been: Samuel Johnson (1754-63); Myles Cooper (1763-75); the Rev. Benjamin Moore (1775-6); William S. Johnson (1787-1800); Charles H. Wharton (1801); the Rt. Rev. Benjamin M. Moore (1801-11); William Harris (1811-29); William A. Duer (1829-42); Nathaniel Moore (1842-9); Charles King (1849-64); Frederick A. P. Barnard (1864-89); Henry Drisler, acting (1888-90); Seth Low (1890-1901); and Nicholas Murray Butler (inaugurated 1902).

SETH LOW,

Ex-President Columbia University.

Columbian College. Columbian College was originally organized in 1821 by special act of Congress, under the auspices of the Baptist denomination. In 1873, in accordance with the provisions of a donation given by William W. Corcoran of Washington, D. C., the charter was changed by special act of Congress, making it a university. By special acts of Congress in 1904 and 1905 the university was made non-sectarian, the name changed to The George Washington University, and authority given to organize, under the charter and in connection with the university, colleges desiring to carry on educational work in the arts, sciences, liberal and technical knowledge; the college to be non-degree-conferring, its faculty recommending students for the baccalaureate degrees only, the degrees being conferred by the university. Colleges may be organized by any society with the consent of the university, the charter providing the mode and manner of nominating and electing trustees. Under this amendatory act Columbian College was reorganized as an undergraduate college in connection with the university, continuing its affiliation and control with the Baptist denomination. See GEORGE WASHINGTON UNIVERSITY, THE.

Columbian Formation, a series of gravels, sands, and clays of Pleistocene age covering the coastal plain of the Atlantic slope from New Jersey southward, and typically developed in the District of Columbia. The formation in the north covers the plain up to elevations of 400 feet, and in the south up to 100 feet. It includes estuarine and delta deposits, and the fossils are recent marine species, indicating a submergence and re-elevation of the coast. The formation may correspond to the Champlain stage of the glaciated portion of the continent. See CHAMPLAIN STAGE; GLACIAL PERIOD.

Columbian University. See COLUMBIAN COLLEGE; GEORGE WASHINGTON UNIVERSITY.

Columbian World's Fair. See WORLD'S COLUMBIAN EXPOSITION.

Columbidæ, kō-lūm'bī-dē, the family of true pigeons, the typical one of the order *Columbæ*, of which it embraces the bulk of the known species, more than 400 belonging to this family. Over half of them are found in the Maylayan and Austro-Malayan Archipelago, and 75 in South and Central America, while all other parts of the world, except the polar regions, have their representative species in smaller numbers. Although our native species give but a faint idea of the richness of color and other peculiarities of adornment of the tropical pigeons, the structural features are remarkably constant and well exemplified in the domestic pigeon. The bill is moderate and compressed, having at its base a soft skin in which the nostrils are placed. The feet have three divided toes before and one behind, all of which are on the same level; the tarsi scutellate. The wings are rather long and exceptionally powerful; the plumage generally compact, and the feathers without aftershafts. One of the most variable features is the tail, which may be short and square or long and pointed, and its rectrices from 12 to 16. Although classed by Cuvier with the gallinaceous birds, the *Columbidæ* differ from them in structure and especially in habits, being monogamous and good flyers. Besides they are unlike the domestic fowl which is the type of the *Gallinæ*, in that the males assist in nest-building and incubation, and the young are not able to walk, and are nourished by the parent birds, which secrete in the double crop a milky fluid utilized to soften their food. Moreover the *Columbidæ* drink at a single draught. They eat seeds and berries, more rarely insects. See DOVE; PIGEON; etc.

Col'umbine, a popular name for *Aquilegia vulgaris* or other species of the genus *Aquilegia*. The common columbine has drooping purplish-blue flowers with five flat sepals; five petals, with long spurs, often curved; five follicles, the root-leaves twice or thrice ternate, the others singly ternate. The claim of the columbine to become the national flower of the United States has been pressed since 1896 by the Columbine Association with offices in Boston. This association urges that the flower is wild and commonly diffused, that it has decorative value, that its common name symbolizes the dove of peace and suggests Columbus, the discoverer; that its Latin name hints at the eagle of power, that the form of the short-spurred variety is strikingly like the Liberty Cap, and that its compound leaf exemplifies the Federal motto *E pluribus unum*.

COLUMBITE — COLUMBUS

Colum'bite, a mineral of variable composition, consisting of a compound niobate (columbate) and tantalate of iron and manganese. When niobium is present in large amount relatively to the tantalum, the mineral is called "columbite," and when the reverse is the case, it is called "tantalite"; the two minerals passing into each other, in nature, by insensible gradations. Typical columbite has a hardness of 6, and a specific gravity of from 5.4 to 5.8, the specific gravity increasing with the proportion of tantalum present. The crystals are short and prismatic, often tabular, and belong to the orthorhombic system. The mineral is black or brownish-black in color, and is often iridescent. In the United States columbite is known to occur in most of the States lying near the Appalachian Mountain system, and also in Colorado, South Dakota, and California. One crystalline mass of it, found in the Black Hills region, is said to have weighed about a ton. The existence of columbite in the United States was first made known through a specimen sent by Gov. Winthrop of Connecticut to Sir Hans Sloane, president of the Royal Society of Great Britain.

Colum'bium, a metallic element, better known as niobium (q.v.).

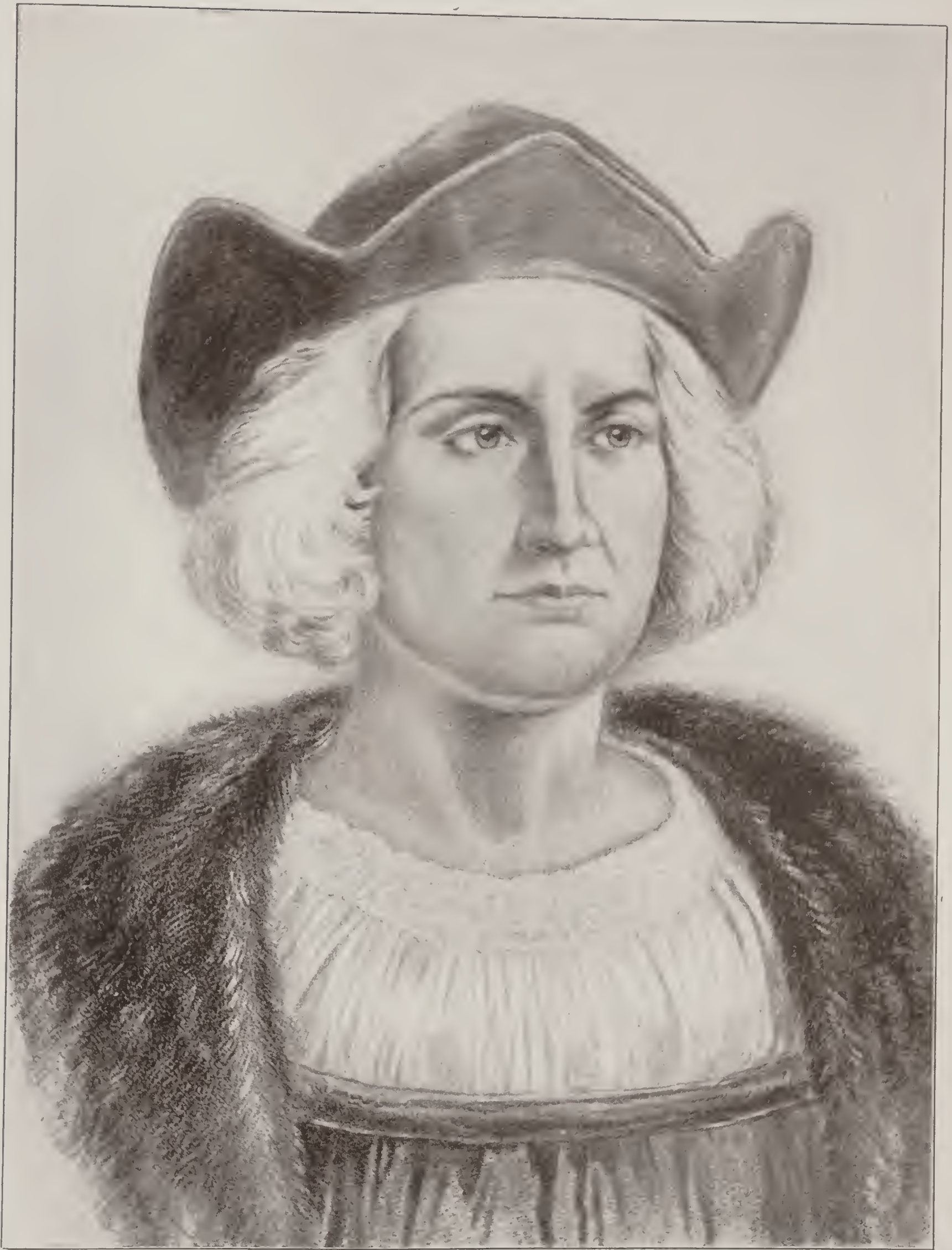
Columbo, the root of a climbing plant, *Jateorrhiza Columbo*, which grows in great profusion in the island of Mozambique. It is also called calumba. The root, sliced transversely into disks, is dried and is used in medicine in the form of an infusion as an appetizer, and tonic. It contains a bitter alkaloid *berberine*, and another bitter principle *columbin*. It is free from tannic acid, so, unlike most bitters, it may be mixed with the preparations of iron. It was formerly employed for diarrhœa, dysentery, and gas in the bowels, being carried to India, whence it is exported.

Columbus, Bartholomew (Sp. Bartolomeo Colon; It. Bartolommeo Colombo, his real name), Italian navigator, brother of Christopher Columbus: b. Genoa about 1432; d. San Domingo May 1515. The events of his early years are not on record. In 1470 we find him established at Lisbon as a mariner and constructor of maps—one of those adventurous navigators whom the patronage of the Portuguese princes had drawn to their capital. About 1486 he visited the Cape of Good Hope, probably with Bartholemi Diaz. It is not known how long he was absent when his brother sent him to England to seek the aid of Henry VII., but it appears certain that Christopher was ignorant of his fate, further than that he was captured by pirates. He did, however, attain the ear of the English monarch, and presented him with a map of the world, but it does not appear that he succeeded in securing English aid. On his return through France, he learned that his brother had already discovered the new world, and had sailed on a second voyage. Hastening to the Spanish court, he was received as became the brother of the admiral. Queen Isabella sent him in command of three store ships to the new colony of Hispaniola, where Christopher received him with joy, and appointed him adelantado or lieutenant-governor of the Indies. In this position Bartolommeo showed great bravery and decision. He shared his brother's imprisonment, and with him was liberated on reaching Spain, where the Spanish monarchs confirmed

his title, and gave him the lordship of the small island of Mona near St. Domingo, with 200 Indians as his personal body-guard. The fierce energy of his character, however, made them jealous of giving him too much latitude in public affairs. He died without issue.

Columbus, Christopher (Sp. Cristobal Colon; It. Cristoforo Colombo, his real name), Italian navigator, the discoverer of America: b. Genoa probably 1446; d. Valladolid, Spain, 20 or 21 May 1506. His father, Domenico Colombo, a poor wool-comber, gave him a careful education. He soon evinced a strong passion for geographical knowledge, and an irresistible inclination for the sea. The details of his early life are confused and unsatisfactory. He appears to have gone to sea at an early age, and to have navigated all parts of the Mediterranean and some of the coasts beyond the Strait of Gibraltar. In 1470 we find him at Lisbon, where he married the daughter of Bartolommeo de Palestrello, a distinguished navigator, who had founded a colony in Porto Santo, an island recently discovered and belonging to the Madeira group, and had left many charts and nautical instruments. Columbus made use of these materials, and his opinion that the other side of the globe contained land, belonging to eastern Asia and connected with India, which was, as yet, little known, became more and more fixed. While the Portuguese were seeking to reach India by a southeast course round Africa, he was convinced that there must be a shorter way by the west. He applied in vain to Genoa for assistance, and equally fruitless were his endeavors to interest John II. of Portugal in the enterprise. He also sent letters on the subject to Henry VII. of England, with the same ill success. He then determined to apply to the Spanish court, Ferdinand and Isabella being at this time the sovereigns of Spain, and after an eight years' struggle with the obstacles thrown in his way by ignorance and malice, he received three small vessels. These were named the Pinta, the Niña, and the Santa Maria; and according to Jal each of them was fully decked and had four masts and a crew of 90 men. The dignity of high-admiral and viceroy of all the countries he might discover was conferred on him, the former to be hereditary in his family. A certain share of the profits was secured to him by a written contract with the sovereigns.

It was early in the morning of Friday, on 3 Aug. 1492, that Columbus set sail from the port of Palos. Eighteen years had elapsed since he had first conceived the idea of this enterprise. The most of that time had been passed in almost hopeless solicitation, amidst poverty, neglect, and ridicule; the prime of his life wasted in the struggle. Nor should it be forgotten that it was to Isabella alone that he was finally indebted for the means of executing his project, which had been coldly rejected by the prudent Ferdinand. Having provided himself at the Canary Islands with fresh water, he sailed southwest into an ocean never before navigated. But when 21 days had elapsed without the sight of any land, the courage of his men began to sink. It was certain, they said, that they should perish, and their visionary commander ought to be forced to return. Some of them even proposed to throw him overboard; and Columbus had to exert all the powers of his daring and



CHRISTOPHER COLUMBUS.

COLUMBUS

commanding spirit to prevent an open rebellion. A phenomenon, which surprised even him, filled his pilots with consternation: the needle deviated a whole degree. But the sea appeared suddenly covered with grass, and again showed symptoms of shoals and rocks. Numbers of birds were also seen. Columbus sailed in the direction from which they flew. For some days the voyage was continued with revived courage, until at last the dissatisfaction of the crews began to break out into open violence; but Columbus, after endeavoring in vain to pacify his men by promises, finally assumed a different tone, and told them it was useless to murmur; that he was determined to persevere. Fully convinced that he must be near the land, he promised a reward to whosoever should first discover it. On the night of 11 and 12 October Columbus himself descried a light which sometimes flickered in the distance and sometimes disappeared, and at two o'clock on the morning of the 12th a cannon shot from the *Pinta* announced that a sailor belonging to that vessel had discovered land.

It was the island of Guanahani, which Columbus believed to belong to eastern Asia and to be connected with India, a belief which he carried with him to his grave. Hence the mistaken names of Indians applied to the natives of America, and that of West Indies applied to the group of islands of which Guanahani forms one. On landing Columbus threw himself upon his knees and kissed the earth, returning thanks to God. The natives collected round him in silent astonishment, and his men, ashamed of their disobedience and distrust, threw themselves at his feet, begging his forgiveness. Columbus, drawing his sword, planted the royal standard, and in the name of his sovereigns took possession of the country, which, in memory of his preservation, he called Saint Salvador. He then received the homage of his followers, as admiral and viceroy, and representative of the sovereigns. Being informed by the natives that there was a rich gold country toward the south, Columbus directed his course toward that region, and reached Cuba on 28 October, and Española (Hispaniola, Hayti), on 6 December; but as one of his vessels was wrecked, and the other separated from him, he resolved to carry the news of his success to Spain. Having built a wooden fort from the wreck of his vessel, he left in it 39 volunteers, and set out on his return, 4 Jan. 1493. The day after he left the island he met the *Pinta*, which had been missing. Both vessels were afterward nearly wrecked in a tremendous storm. Columbus, more interested for his discovery than for himself wrote an account of his voyage on a piece of parchment, which he secured in a cask, and threw the whole overboard, in the hope that it might be carried ashore. He had hardly finished his work when the gale subsided. On 15 March he re-entered the port of Palos amid the acclamations of the people, the thunder of cannon, and the ringing of bells. He hastened immediately to Barcelona, where the court then was, and entered the city in a triumphal procession, with the productions of the newly discovered countries carried before him. A chair was placed for him next to the throne, and, seating himself, he gave an account of his discoveries. He was created a grandee, and all the marks of royal favor were lavished upon him.

On 25 Sept. 1493, he set sail from Cadiz with 3 large ships of heavy burden and 14 caravels, carrying 1,500 men. On 3 November he discovered the island of Dominica, and afterward Mariegalante, Guadeloupe, and Porto Rico, and on the 22d arrived at Hispaniola. Finding the colony he had left destroyed, he built a fortified town, which he called, in honor of the queen, Isabella, and of which he appointed his brother Diego governor. He immediately left the island in order to make new discoveries, visited Jamaica, and returning after a voyage of five months, worn down with fatigue, found to his great joy that his brother Bartolommeo, who had escaped from his captivity, had arrived at Isabella with provisions and other supplies for the colony. Meanwhile a general dissatisfaction had broken out among his companions, who, instead of the expected treasures, had found hardships and labor. They set on foot many calumnies, and gave the most unfavorable description of the country and the viceroy. Columbus thought he could not better oppose these reports than by sending considerable treasures to his sovereigns, and for this purpose collected gold from the natives, which was not done without violence and some cruelty. Aguado, a personal enemy of Columbus, was sent as commissioner to investigate the complaints against the great discoverer, who, thinking it time to vindicate himself in the presence of his sovereigns, prepared to return to Spain. Having appointed his brother Bartolommeo adelantado or lieutenant-governor, he embarked for Spain in March 1496 with 225 Spaniards and 30 natives. In Spain calumny was silenced by his presence, and probably still more by his treasures. Yet his enemies were powerful enough to detain the supplies intended for the colony a whole year, and to retard the fitting out of a new expedition.

It was not till 30 May 1498, that he sailed with six vessels on his third voyage. To man these vessels criminals had unwisely been taken—a measure which Columbus himself had advised, and which had been taken up with great satisfaction by his enemies. Three of his vessels he sent direct to Hispaniola; with the three others he took a more southerly direction, for the purpose of discovering the mainland, which information derived from the natives induced him to suppose lay to the south of his former discoveries. He visited Trinidad and the continent of America, the coasts of Paria and Cumana, and returned to Hispaniola, convinced that he had reached a continent. His colony had been removed from Isabella, according to his orders, to the other side of the island, and a new fortress erected called St. Domingo. Columbus found the colony in a state of confusion. After having restored tranquillity by his prudent measures, in order to supply the deficiency of laborers he distributed the land and the inhabitants, subjecting the latter to the arbitrary will of their masters, and thus laying the foundation of that system of slavery which has lasted down to our time. His enemies, in the meantime, endeavored to convince his sovereigns that he had abused his power, and that his plan was to make himself independent, till at last even Isabella yielded to the wishes of Ferdinand, who had previously become convinced of the truth of the slanders. Francisco de Bobadilla was sent to Hispaniola with extensive powers to

COLUMBUS

call the viceroy to account. As soon as he reached the island he summoned Columbus to appear before him and put him in irons. His brothers were treated in the same manner. All three were sent to Spain, accompanied by a number of written charges, drawn up from the statements of the bitterest enemies of Columbus. Columbus endured this outrage with noble equanimity, and wrote, as soon as he had arrived in Cadiz, 25 Nov. 1500, to a lady of the court vindicating his conduct, and describing in eloquent and touching language the treatment he had received. The fetters with which he had been bound he kept to the day of his death, and his son Hernando states that he even ordered that they should be enclosed with him in his coffin. Orders were immediately sent directing him to be set at liberty, and inviting him to court, where his sovereigns received him with the same distinction as formerly. Isabella was moved to tears, and Columbus, overcome by his long-suppressed feelings, threw himself upon his knees, and for some time could not utter a word for the violence of his tears and sobbings. He then defended himself by a simple account of his conduct, and was re-instated to his dignities. Ferdinand even consented to dismiss Bobadilla, which was intended for the first step toward the promised restoration of the great discoverer in his dignities. But these dispositions in the monarchs were soon changed. There was much talk of great expeditions, and in the meantime Nicolas de Ovando y Lares was sent as governor to Hispaniola. Columbus still urged the fulfilment of the promises solemnly made to him; but after two years of delay he became convinced that there was no intention to do him justice.

But he had now learned to suffer, and he was principally desirous of completing his work. Supposing the continent which he had seen to be Asia, he did not doubt that he should find, through the Isthmus of Darien, a way to the East Indies, from which the first fleet of the Portuguese had just returned richly laden. In four slender vessels supplied by the court for this purpose Columbus sailed from Cadiz on his fourth and last voyage 9 May 1502, with his brother Bartolommeo and his son Hernando; arrived contrary to his original intention off St. Domingo 29 June, and was denied permission to enter the port for the purpose of refitting his vessels, and escaping an approaching storm. He succeeded, however, in anchoring his small squadron in a place of safety, and rode out the storm, while a fleet of 18 vessels, which had put to sea in spite of his warning, was almost entirely destroyed. He then continued his voyage to Darien, but without finding the expected passage. Two of his vessels were destroyed by a gale; the two others were wrecked off Jamaica, where he was scarcely able to save himself and his companions. Here the severest trials awaited the constancy of Columbus. Separated from the other part of the world, his destruction seemed to be certain. But he succeeded in procuring a few canoes from the natives, and prevailed on some of his boldest and best men to attempt a voyage to Hispaniola, in two canoes, in order to inform the governor of his situation. Several months elapsed without a glimpse of hope. Part of his companions, reduced to despair, rebelled, repeatedly threatened his life, separated from him, and settled

on another part of the island. Here they alienated the minds of the natives by their cruel treatment, so much that they ceased to bring them supplies. The death of all seemed inevitable; but Columbus, whose courage rose with the danger, preserved his men in this crisis. He had ascertained that a total eclipse of the moon was about to take place, and threatened the natives with the vengeance of his God if they should persist in their enmity. As a proof of his assertion the moon, he said, would lose its light, in token of the chastisement which awaited them. When they beheld his threat verified they hastened to bring him provisions, and implore his intercession with the Deity. But hostilities now broke out between him and the rebels, in which several of the latter were killed, and their leader was taken prisoner. After remaining a year on the island, relief at last appeared. The two canoes had reached Hispaniola in safety, but the messengers could not prevail on the governor to undertake the deliverance of the admiral. They finally bought a vessel themselves, and it was on board this ship that Columbus left Jamaica 28 June 1504. He went to St. Domingo, but only to repair his vessel, and then hastened back to Spain. He arrived in Spain ill and exhausted. The death of the queen soon followed, and he urged in vain on Ferdinand the fulfilment of his contract. After two years of illness, humiliations, and despondency, Columbus died at Valladolid. His remains were transported, according to his will, to the city of St. Domingo, but on the cession of Hispaniola to the French, they were removed in January 1796 with great pomp, to the Cathedral of Havana in Cuba. A splendid monument was erected to him, in a convent at Seville, where his body lay before being transferred to St. Domingo. In 1898 his remains were again removed to Spain, Cuba being no longer a Spanish possession since the war with the United States.

In the vigor of manhood Columbus was of an engaging presence, tall, well formed, and muscular, and of an elevated and dignified demeanor. His visage was long, his nose aquiline, his eyes light gray, and apt to enkindle. His whole countenance had an air of authority. Care and trouble had turned his hair white at thirty years of age. He was moderate and simple in diet and apparel, eloquent in discourse, engaging and affable with strangers, and of great amiability and suavity in domestic life. His temper was naturally irritable, but he subdued it by the benevolence and generosity of his heart. Throughout his life he was noted for a strict attention to the offices of religion; nor did his piety consist in mere forms, but partook of that lofty and solemn enthusiasm with which his whole character was strongly tinged. Of a great and inventive genius, a lofty and noble ambition, his conduct was characterized by the grandeur of his views and the magnanimity of his spirit. For further information respecting the life of Columbus various authorities are available to the inquirer. His son Ferdinand wrote a memoir, but the original is lost, though an early Italian version exists which has been translated into English and other languages. His own journal of his first voyage may also be read in English, both it and Major's 'Select Letters of Columbus' being published by the Hakluyt Society.

COLUMBUS

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Columbus, Diego, *dē-ā'gō* (It. Giacomo Colombojē), Italian voyager: b. Genoa about 1450; d. after 1509. He was a brother of Christopher Columbus, whom he accompanied on the second voyage to America, in 1493. He was sometimes left in command at the settlements of Isabella and Santo Domingo and returning to Spain in 1500, subsequently entered the priesthood.

Columbus, Diego (Sp. Colon, *kō-lōn'*): b. probably at Lisbon about 1476; d. Montalvan, near Toledo, Spain, 23 Feb. 1526. He was a son of Christopher Columbus (q.v.), and from 1492 till his father's death was a page at the Spanish court. He was confirmed admiral of the Indies and governor of Hispaniola in 1509, where he ruled with great pomp and splendor, but his opponents in the New World succeeded in curtailing his powers and he was recalled to Spain.

Columbus, Ferdinand (Sp. Ferdinando Colon, *fēr-dē-nān'dō kō-lōn'*), Spanish voyager: b. Cordova, Spain, 15 Aug. 1488; d. Seville 12 July 1539. He was a son of Christopher Columbus, whom he accompanied on his father's fourth voyage 1502-4. His library of 20,000 books was bequeathed to the cathedral chapter of Seville and was known as the "Columbina." But 4,000 of these now remain and the history of the Indies by him is also lost as well as the original Spanish of his life of his father, largely drawn upon by Las Casas. This is the basis of the majority of the lives of Columbus.

Columbus, Luis, *loo-ēs'* (Sp. Colon), Spanish noble: b. Santo Domingo 1521 or 1522; d. Oran, Africa, 3 Feb. 1572. He was a son of Diego Columbus 2d (q.v.), and a grandson of Christopher Columbus. He was given the title of admiral of the Indies, but in 1530 was obliged to relinquish the title of viceroy, receiving in exchange the island of Jamaica, an estate 25 leagues square in Veragua, a pension of 10,000 ducats and the titles of Duke of Veragua and Marquis of Jamaica. He was captain-general of Hispaniola 1542-51. Arrested in 1559 for having three wives, he was imprisoned for three years and then banished to Africa. Felipa, his daughter married her cousin, Diego, who then became Duke of Veragua, but dying childless in 1518 the family of Columbus then became extinct in the male line. The present Duke of Veragua (b. 1837), traces his descent from Columbus through Diego, Cristoval, Diego's son, and Francesca, the daughter of Cristoval and sister of Diego Columbus, who died in 1578.

Columbus, Ga., a city and county-seat of Muscogee County, situated on the east bank of the Chattahoochee River, at the head of navigation, and on the Central of Ga., the Southern,

the Seaboard A. L., and the Georgia F. & A. R.R.'s. It is also connected with Appalachicola, Fla., by three steamer lines. Columbus is in the centre of a fertile cotton and agricultural producing region, and near forests of conifers and hardwood, and deposits of coal and iron. It is also at the foot of the "Piedmont" region, where the rock ledges of the older geological formations give place to the coast plain; hence the Chattahoochee falls sharply for many miles over its rock bed to its new levels and deeper water, affording an immense head of power,—115 feet fall, with 42,500 horse-power, at average low water, within a mile of Columbus, and 368 feet with 134,000 net horse-power within 36 miles. Three large companies (the Columbus Power Company, the Coweta Company, and the Chattahoochee Falls Company) are making this power available by a series of dams, transmitting electric power from dynamos. Two great dams nearly 1,000 feet long, developing 28,866 horse-power, are already built; and five others, one with a fall of 52 feet, and all developing over 70,000 horse-power, are announced within a year or so. The Coweta Company owns 12 miles of river front to the north. This power implies a great future extension of industries; but the cotton manufacture is already so extensive as to give the city the name of "the Lowell of the South." There are now six large mills here, operating 154,000 spindles and 4,400 looms, employing about 4,000 hands, paying nearly \$1,000,000 a year in wages, and using toward 50,000 bales of cotton a year. The great Eagle and Phoenix mills were the pioneers of large manufacture; the Coweta Company has a mill of 35,000 spindles and a village (Bibb) of its own; the North Highlands mills represent an investment of \$500,000, and are second in the South in equipment and arrangement. There are also two cotton compressors and ginning works, among the largest in the South; cotton-seed oil mills, etc. Next to this, and equally old, is the iron industry, with two great concerns; the Columbus Iron Works, dating from 1853, which with their department, the Southern Plow Company, cover six acres, and are to be the largest in the South; and the Goldens Foundry and Machine Company. These manufacture all kinds of agricultural implements, cotton screws and compressors, engines and boilers, etc. One of the largest syrup and sugar refining works in the South has lately been erected; there are also a large wagon factory, a barrel factory, three show-case works, grist mills, etc. The trade of the city is large; it is the distributing centre of all southwest Georgia and a considerable part of central Georgia and Alabama. There are five cotton warehouses, and the total receipts of cotton are about 165,000 bales a year.

The city has broad handsome streets, which in the original plan were intended to be boulevards with parks down the centre. Steps are being taken to carry out the design. The business streets are being paved, and 35 miles of macadam roads are completed. There is an electric street railway system, and the city is connected with its suburb, Girard, Ala., by a bridge, which is crossed by the Central R.R. of Ga. There are some fine buildings, and the number is rapidly on the increase. The \$60,000 passenger station of the Central of Georgia is one; the Masonic Temple is one of the finest in

COLUMBUS

the South, and the Odd Fellows have planned an equal; the new Y. M. C. A. building, faced with the finest Georgia marble, is to be one of the most beautiful in the Southern States; and several of its 23 churches, embracing all denominations, are excellent specimens of architecture. The school system is justly famed: Columbus was the first city in the South to adopt graded schools and manual training. It has five large modern school buildings, and the system includes not only free kindergartens and a night school, but a primary industrial school for the children of the poorer wage-earners, with a unique provision for "little dinner carriers" (children carrying dinner to parents at work), regulating the hours to give them a longer nooning. The improvement of the condition of cotton-mill workers (all of the "poor white" class) has engaged the attention of the owners, who have not only provided excellent modern villages for them, but schools and other elevating influences. The Columbus Power Company proposes to build and partly maintain at Bibb a superior school for the operatives' children; and the Eagle and Phoenix Club for employees is a building with library, gymnasium, and all forms of amusement, built by the company, and then given over to the absolute control of the hands. There is also a public library in the city. The city government is by a mayor, elected for two years, and a council, elected on general ticket, the council appointing the other city officers.

History.—Columbus was laid out in 1828, on land taken partly from an Indian reservation. As early as 1845 it had a cotton mill and was a centre of the cotton trade; in 1846 it was nearly destroyed by fire. In 1853 the first iron foundry was built there. During the Civil War it was the reliance of the Southern armies for their clothing, shot and shell, and swords. In its streets and those of Girard was fought the last battle of the War east of the Mississippi, when on 16 April 1865 Wilson captured it. Pop. (1870) 7,401; (1880) 10,123; (1890) 17,303; (1900) 17,604 (10,337 whites); (1903) including suburbs, about 30,000.

Columbus, Ind., a city and county-seat of Bartholomew County, in the southern central part of the State, situated on a fork of the White River and on the Cleveland, C. Ch. & St. L. and the Pittsburg, C. Ch. & St. L. R.R.'s. It has large manufactories of cerealine, agricultural implements, and furniture, and starch- and flour-mills. Pop. (1900) 8,130.

Columbus, Kan., the county-seat of Cherokee County, in the southeastern part of the State, situated on the Kansas City, Ft. S. & M. and the St. Louis & S. F. R.R.'s. It is in an agricultural and mining district, coal and zinc being found in the neighborhood. Pop. (1900) 2,310.

Columbus, Miss., a city and county-seat of Lowndes County, situated on the Tombigbee River and on the Mobile & O. and the Southern R.R.'s., 150 miles southeast of Memphis and the same distance northeast of Jackson. It is the farming trade centre of the country, and has a large cotton-mill, machine shops and lumber-mills. It is the seat of the State Industrial Institute and College for girls and of Franklin Academy. Pop. (1900) 6,484.

Columbus, Neb., the county-seat of Platte County, in the eastern part of the State,

situated on the Loup River, near the Platte, and on the Union Pacific and the Burlington & M. R.R.'s. It has various manufacturing interests and is the seat of a Roman Catholic academy. Pop. (1900) 3,522.

Columbus, Ohio, the capital of the State and the county-seat of Franklin County, is located at the centre of the State and at the junction of the Scioto and Olentangy rivers, in lat. 39° 57' N., lon. 83° 3' W., on a slightly elevated alluvial plain, and is nearly equidistant from Cincinnati, southwest; Cleveland, northeast; Toledo, northwest; and Marietta, southeast, the average distance from these points being 115 miles.

Columbus was made the capital by the legislature in 1810, and became the permanent capital in 1816, the original Territorial and State capital having been Chillicothe. The first State buildings were of brick, and cost \$85,000. The present massive buildings and additions are of dressed native gray limestone, in the Doric style of architecture. They cover nearly three acres, and their total cost has been \$2,500,000.

As early as 1812 Columbus was surveyed in rectangular squares; it was incorporated as a village in 1816, and chartered as a city in 1834. In general outline the city resembles a Maltese cross. It extends eight miles north and south, and seven miles east and west on its arms of expansion. Its longest streets, High and Broad, bisect the city north and south and east and west respectively. The uniform width of the former is 100 feet, and the breadth of the latter is 120 feet. Broad Street is planted with four rows of shade-trees for its entire length east of the capitol square, where it penetrates the fashionable residence district. High Street is the leading business thoroughfare. Capitol square, a miniature park of 10 acres, is situated at the intersection of these streets, two squares east of the Scioto River. The residence portions of the city contain many beautiful homes and fine mansions. There are numerous apartment buildings; the houses of the average people are substantial and comfortable; the tenement districts are but ordinary of their class. On the business streets are many handsome, commodious blocks; many steel, brick, and stone office buildings from 8 to 14 stories high, as well as commodious railway buildings and stations. The streets are wide, well paved and lighted, and are kept in good condition.

The police and fire departments are excellent; the water supply is pure and ample, and the sewerage system good. Natural gas is the principal fuel for domestic use. Bituminous coal, in unlimited quantities, is found a few miles south.

The 40 or more church buildings of Columbus include those of the following religious denominations: Methodist Episcopal, United Presbyterian, Roman Catholic, Lutheran, Baptist, Disciples, Friends, Christian Scientist, Evangelical Jewish, Independent German Protestant, German Evangelical Protestant, African Methodist Episcopal, Seventh Day Adventists, and United Brethren. These churches have a total active church membership of 75,000. The newspapers and periodicals include four English and two German dailies, 21 secular weeklies, and 33 trade, professional, religious, fraternal, and other publications. There are 38 large public school

COLUMBUS, OHIO.



State Capitol (upper).

Looking North on East Broad Street (lower).

COLUMBUS — COLUMN

buildings, four being devoted to high school purposes. The schools have an average attendance of 18,500, the high schools having 2,300. Among institutions for higher education are the Ohio State University, Capital City University, and St. Mary's Academy. Professional schools include one dental and three medical colleges, and a law school; and there are also private and religious educational institutions. Here are 20 private hospitals; and Columbus is the location of a State hospital for the insane; State institutes for the education of deaf-mutes, blind, and imbecile youth; the Ohio Penitentiary; county, city, and memorial buildings; five opera houses; and a board of trade building. There are five public parks and a United States military post, Fort Columbus. This post, known also as Columbus Barracks, was originally an arsenal, and now has quarters for eight companies of infantry.

From Columbus 18 steam railroads radiate to all parts of the State, intersecting all through lines running east, west, northwest, northeast, and south; and eight interurban lines in operation, and as many more nearing completion, connect with a model street-railway system. Prominent business interests of the city are represented by 6 national and 20 private banks, trust companies, savings and building and loan associations, with a combined capital of \$25,000,000. There are 289 great and small manufacturing establishments, representing an investment of \$35,000,000, including steel plants, blast-furnaces, malleable iron works, and manufactories of various steel, iron, and wood products, beer and liquors, trucks, cars, cash registers, watches, furniture, agricultural implements, mine, mill, and farm supplies, shoes, cloth fabrics, gloves, hosiery, clothing, medicines, buggies, wagons and all kinds of vehicles, automobiles, novelties, specialties, and general merchandise, with an annual output approximating in value \$105,000,000. The mercantile trade is extensive, including all lines, and embracing 23 wholesale and hundreds of retail establishments.

The people of Columbus possess the characteristic push and enterprise of Western cities, and much of the culture and artistic taste of those in the East. The population is drawn from all the counties in the State, especially the 45 which are centrally located. Two thirds of the population are native-born. The largest foreign elements are German, Irish, Welsh, English, and Italian, in this order, and include scattered groups and individuals from almost every civilized and semi-civilized country in the world. Since 1880, when it had 41,215 inhabitants, Columbus has grown rapidly. In 1900 it had a population of 125,560, and that number has increased, according to the estimate of 1903, to about 150,000.

WILLIAM ALEXANDER TAYLOR.

Columbus, Texas, the county-seat of Colorado County, situated on the Colorado River and on the Southern P. R.R. Its chief industry is its cotton trade. It is the seat of Colorado College. Pop. (1900) 1,824.

Columbus Barracks. See COLUMBUS, OHIO.

Columella, kōl-ū-mēl'la, **Lucius Junius Moderatus**, Roman practical writer on agriculture: b. Cadiz, Spain. He flourished about the middle of the 1st century, and wrote 12 books on gardening ('De Re Rustica'), one of

which was a metrical combination of the Georgics of Vergil. He treats in this work of all the branches of agriculture. The earlier editions of this work contain also his treatise 'De Arboribus,' in one book. According to Pliny, Columella wrote a work on ancient sacrifices for obtaining the fruits of the earth, but this is lost. The *editio princeps*, printed in folio by Jenson at Venice, in 1472, and forming part of a collection of 'Rei Rusticæ Scriptores varii,' is very rare. The most complete edition is contained in the 'Scriptores Rei Rusticæ' of Schneider (1794-7).

Column (Latin, *columna*), in architecture, a round pillar. In the earliest times the column was merely a tree-trunk, or its imitation in stone, used to support the roof. The parts of a complete column are its base, on which it rests; its body, called the shaft; and its head, called the capital. Columns are used to support the entablature of an order, which has also its proper division. In the most ancient times columns of wood were most usual, as being most easily wrought. In countries like Egypt, where timber fit for construction is scarce and stone abundant, the latter became the principal material for columns, and those of Egypt are remarkable for the beauty of their workmanship and the durability of their materials. The Egyptian columns were numerous, close, short, and very large. They were generally without bases, and had a great variety of capitals, from a simple square block ornamented with hieroglyphics, or faces, to an elaborate composition of palm leaves, not unlike the Corinthian capital. The Greeks, for their columns, used marble of the finest kind, with which their country abounded; and other nations the stone or material of their country. The Greeks considered the column as an essential part of the architecture of their temples, and never used it as a mere decoration.

The manner of constructing the columns of all the orders rests on similar principles. They are all divided into three primary parts or divisions, the base, the shaft, and the capital, except the Doric order, which has no base. The lowest or thickest part of the shaft is used by architects as the universal scale or standard whence all the measures which regulate and determine heights and projections are taken; and this standard or scale must be understood before any architectural design can be commenced. The universal architectural scale is called a diameter, and is the diameter of the lowest or the largest part of the column; and, unlike the foot, inch, or yard, is as various as the size of columns. By the diameter, of course, is meant that of the circle which forms the bottom of the column. Half of this diameter, or the length of the radius which forms the circle, is called a module, and is used as well as the diameter as a primary standard of mensuration by some writers upon architecture. These measures of length are subdivided as follows, namely: the diameter into 60 parts, and the module into 30 parts, called a minute. The Doric column has no base. The Ionic column has one peculiar to itself called the Attic, which, with that of the Corinthian order, is described under the article ARCHITECTURE.

The shafts of the different orders differ in height and even in various examples of the same order. The capitals also are as various. Col-

COLUMN — COLVILLE

umns are either plain or fluted, and the flutes and manner of dividing them are different in the Doric and Corinthian orders. The Ionic flutes much resemble the Corinthian, and in many instances are exactly similar. Columns of all the orders taper gradually toward the top, but in the middle there is sometimes a slight swelling called an entasis. Roman architecture being derived from the Greek, Roman columns were either exactly similar to Greek ones or modifications of the latter. The principal modifications of the column made by the Romans were that form of the Ionic capital in which there were four pairs of diagonal volutes instead of two pairs of parallel ones, and that peculiar to the Composite order, in which the capital of the Corinthian column was combined with that of the diagonal or modern Ionic.

Columns are also often used for commemorative purposes as well as for architectural supports; like the Trajan and Antonine columns in Rome, and that called the Monument in London, which was erected in commemoration of the great conflagration of 1666, and is one of the loftiest, the best constructed, and the most beautiful. It is a Doric fluted column, 202 feet high from the bottom of the pedestal, which is ornamented with bas-reliefs of Charles II. and his court giving protection to the fallen city, and various inscriptions, to the top of the vase of flames, by which it is surmounted.

Column, in military tactics, a deep, solid mass of troops, formed by placing several bodies of men one behind another (sections, platoons, companies, squadrons, and even several battalions). The column is either open or close. When a battalion is formed in open column, room enough is left between the companies for them to wheel into line. When the distance left between the companies is very small, the battalion is said to be formed in close column. When the distance is intermediate between that in close and that in open column, it is said to be formed either for marching or for attack. On the march and in manœuvring the arrangement of troops in column is general and convenient, and this order is usually kept up till the actual fighting is about to begin; but it is as a rule unsafe to expose troops in column to the firearms of the present day. This formation consequently is retained in combat only when time and space do not allow of any other being adopted, or for some other special reason.

By dividing a large force into columns it becomes possible to march in places where it would be impracticable to move with unbroken lines. They also increase the force and steadiness of troops, both in attack and defense. The drawing up of the infantry in line is usually advisable where there is no obstacle in the ground to prevent advancing in this order. The order in mass may be preferred where a charge is intended, in which physical force, given by the depth of the column, is necessary and also where a charge, particularly of cavalry, is apprehended. Though a cannon ball, and still more a shell, in the midst of the mass, causes a greater havoc, the probability of being hit is diminished on account of the small front exposed.

An objection to columns, founded on the difficulty of moving so dense a mass, and of changing it into a line, has been removed in modern times by the practice of making the

columns consist of only one battalion, and by disposing these single battalions near each other in such a way as to support one another by their fire, instead of arranging them uselessly one directly behind another. By the usual way of forming the columns toward the centre, those have received such a mobility and facility of development that a line may be restored in two or three minutes. The charge in close columns, which has been especially common among the French, is of the greatest effect when it succeeds; but when it fails the whole body of assailants is exposed to annihilation or to rout, no orderly retreat being possible. The attack with columns at some distance from each other has this advantage, that the facility of manœuvring is much greater. This mode of attack has been frequently employed in assulting squares of infantry. Marching and fighting in lines, however, are the modes usually practised by cavalry. Column roads are such roads as may be passed with all kinds of arms; when the ordinary road is ruined, they are laid out across the fields and marked by poles with straw (*jalons*).

Column of July, a monument erected in Paris in 1840, on the site of the old Bastille in honor of the citizens killed in the revolution of 1830. It is a shaft of bronze on a marble base, capped with a gilded statue of the Genius of Liberty. It is 154 feet high and 13 feet in diameter.

Column of Saint Mark. See VENICE.

Column of Trajan, a monument erected in Rome in 114 A.D. in honor of the emperor. It is a Roman Doric column of white marble of 34 blocks, 23 composing the shaft, on which is carved representations of various scenes in Trajan's campaigns, containing 2,500 figures of men, each about two feet in height. The quadrilateral pedestal bears an inscription which can easily be read. It is 127½ feet high, exclusive of the statue of St. Peter, which now stands on the apex of the column, having taken the place of the colossal figure of Trajan in 1587.

Column Vendome, vōñ-dōm, a monument erected in the Place de Vendome, Paris, by Napoleon I., to commemorate the victories of the Grand Army over the Russians and Austrians in 1805. It is similar in design and ornamentation to the Column of Trajan, but is built of masonry encased in bronze taken from 1,200 captured guns, and capped by the statue of Napoleon. It is 142 feet high and 13 feet in diameter. It was overthrown in 1871 during the Commune but was restored in 1875.

Colure, kō-lūr', one of two imaginary great circles of the celestial sphere passing through the celestial poles; one passing through the equinoctial points of Aries and Libra and the pole of the equator; and the other through the solstitial points of Cancer and Capricorn, and the poles both of the ecliptic and equator. For this reason the first is called the equinoctial, and the second the solstitial colure. The name, meaning "docked" or "dock-tailed," is now rarely used; it was originally applied because a portion of these circles is always concealed under the horizon.

Col'ville, SIR Henry, English general: b. 10 July 1852. He was educated at Eton and entered the grenadier service in 1870. He

COLVIN — COMANCHE

served in Egypt, the Sudan, Uganda, and elsewhere, was knighted in 1885, and in 1897 was promoted major-general. He has published: 'A Ride in Petticoats and Slippers' (1879); 'The Accursed Land' (1884); 'History of the Sudan Campaign' (1887); 'The Land of the Nile Springs' (1895); 'The Work of the Ninth Division' (1901).

Colvin, kōl'vīn, Sidney, English critic: b. Norwood, Eng., 18 June 1845. He was professor of fine arts at Cambridge 1873-5, since when he has been keeper of prints and drawings at the British Museum. His writings include: 'Children in Italian and English Design' (1872); 'Life of Walter Savage Landor' (1881); 'Life of Keats' (1887); 'A Florentine Picture and Chronicle' (1898); 'Early History of Engraving in England' (1901).

Col'well, Stephen, American lawyer and writer: b. Brooke County, Va., 25 March 1800; d. Philadelphia 15 Jan. 1872. He graduated at Jefferson College, studied law, was admitted to the bar, and practised for some years in Pittsburgh. About 1830 he removed to Philadelphia, became an iron merchant, and amassed a fortune. He early developed a fondness for the study of finance, political economy, and social science, and frequently published the results of his studies on questions of current interest or debate. During the Civil War he aided the administration with pen, purse, and voice, and was a liberal supporter of the work of the sanitary commission. He was appointed by the government one of the commissioners to examine the whole internal revenue system and suggest improvements. He left his large and valuable library of works on political and social science to the University of Pennsylvania, where he also endowed a professorship of social science. Of his writings the following may be mentioned: 'Relative Position in Our Industry of Foreign Commerce, Domestic Production, and Internal Trade' (1850); 'New Themes for the Protestant Clergy' (1851); 'The South; . . . Effects of Disunion on Slavery' (1856); 'Ways and Means of Commercial Payment' (1858), his last and most important work.

Colymbidæ, kō-līm'bī-dē, a family of birds which includes the divers and grebes. See DIVER; GREBES.

Col'za Oil, or Rape Oil, an oil, familiar from its use as an illuminating agent in the moderator and other lamps, expressed from the seeds of several plants of the cabbage and turnip genus, the name being originally "kolzaad" (Dutch), that is kail- or cabbage-seed. It is yellowish brown, has a specific gravity of .92, and little or no smell, and dissolves in hot alcohol and in ether. It becomes thick and solid only at very low temperatures; when heated it volatilizes, but not completely, undergoing partial decomposition. It is purified for use by continued agitation with sulphuric acid, which destroys mucilaginous matter from the seed, and washing with water to remove all trace of the acid. The oil is largely used both in Great Britain and on the Continent in soap-making, tanning, fulling of cloth, lubricating machinery, and for burning. For the last it is so well adapted that it has been specially recommended for lighthouse purposes. It is brilliant and

steady, is managed with very little attention, and is cheap. In these respects it is said to be superior to spermaceti.

Coma, in medicine, a state of complete or almost complete insensibility, resulting from various diseases, as apoplexy; from narcotics, as opium; from accident or injury to the brain; or from excessive cold. In cases of coma the pulse is usually low and soft, but sometimes quick, the breathing is rarely stertorous, the pupils of the eyes are commonly more or less dilated, and the face is often swollen and livid. The patient is either altogether unconscious and incapable of replying to any question, or he makes incoherent and rambling statements. Stimulating agencies and blistering are sometimes used in the treatment of comatose cases, but generally the disease or injury producing the condition determines the remedy.

Coma Berenices, bër-ě-nī'sēz ("the Hair of Berenice"), a northern constellation, the name of which is due to the flattery of Alexandrine astronomers, who professed to see in the new constellation a lock of the beautiful hair of Berenice, wife of Ptolemy Euergetes. Callimachus in Greek and Catullus in Latin wrote poems descriptive of the apotheosis of the curl. Ptolemy did not introduce it into the *Almagest* as a distinct constellation, but called it *Plokamos* (Gr., "hair," or "curl"). Tycho Brahe restored it as a distinct constellation in his catalogue of 1602. It is formed of rather faint stars, none being brighter than the fourth magnitude. Baily, in the "B. A. C." in 1845, attached the first three letters of the Greek alphabet to three of the brighter stars. The constellation is surrounded by Ursa Major, Canes Venatici, Boötes, Virgo, and Leo.

Comacchio, kō-mä-chē'ō (ancient COMAC-TIUM, Italy, town in the province of Ferrara, in Emilia, about 20 miles north of Ravenna and 30 miles southeast of the city of Ferrara. The town is built on islands which are connected by bridges. The chief industries are fishing and manufacturing salt.

Coman, Katherine, American teacher: b. Ohio 1857. She has been professor of economics in Wellesley College (Mass.) since 1900. She has written: 'Growth of the English Nation' (1895); 'History of England' (1899); 'History of England for Beginners' (1901), and in collaboration with her colleague Katherine Lee Bates, 'English History Told by English Poets' (1902).

Comana, kō-mā'nā. 1. An ancient city of Cappadocia, supposed to be the modern Elbostan, on the river Sarus, celebrated in antiquity for its temple of Artemis Tauropolis, and for the great devotion of its inhabitants to the worship of that goddess. Over 6,000 persons were engaged in the service of the temple. The city was governed by the high priest, who was always a member of the reigning family, and took rank next to the king. 2. A city of Pontus, now Tokat, on the river Iris, and almost as famous for its devotion to Artemis as the other city of the same name.

Comanche, kō-män'chē (also **Camanche, Chouman, Comande**, a Spanish name; their own name is Nüm, "people"; the Sioux gave them one which the French turned into *Padouca*), a powerful and ferocious tribe of the

COMANCHE STAGE — COMBAT

widely distributed Shoshonean stock, speaking the same language as the Shoshoni of Wyoming, and traditionally their neighbors. When first made known to the whites by the French under Dutisné, they were located in eastern Colorado; they had already obtained horses from the Spaniards and become nomads and expert horsemen, and horse-breeders, for the French bought horses from them. In 1724 another French expedition made a treaty with them. They seem shortly after to have been pushed southward by the Sioux, and we find them later roving the plains of northwestern Texas, making plundering raids from Colorado through Texas, deep into Mexico, and westward to Santa Fe. They lived in skin wigwams, with few or no fixed villages except near the Spaniards, and were in eight bands, with a very loose organization. They probably numbered 5,000 warriors, and 25,000 in all, at their best estate; one village near the Spaniards had 800 warriors, and over 4,000 in all. They were at constant war, both with the Spaniards and the other Indian tribes, and in 1783 engaged in a wholesale war with the former; but Anza inflicted a crushing defeat on them, killing 30 of their chiefs, and there was peace for a time. In 1816 they are said to have lost 4,000 of their number by an epidemic of smallpox; but they were still estimated at 9,000; and in 1847 at 10,000 or 12,000, one fifth warriors. They recruited their numbers by kidnapping and adopting Mexican children, boys or girls. For all the years of immigration into those regions, down to 1875, they were the bloody and relentless scourge of the white settlers, and furnished a good part of the Indian horrors of the southwest. They were once placed on a reservation in Texas, but were driven off. In 1868 the bulk of them agreed to go on a reservation in western Oklahoma; but the Quahada or Staked Plain band refused, and kept up their murderous forays. They were sharply punished by Col. McKenzie at McClellan's Creek in 1872, in which year they were estimated at 3,218 on the reservation, with 1,000 more in roving bands. The last of these surrendered in 1875. In 1901 their reservation in Oklahoma was thrown open to settlement. At present they number about 1,400.

Comanche Stage, in American geology a great limestone formation of Lower Cretaceous age that covers much of northern Mexico, and parts of Texas, New Mexico, Indian Territory, and Kansas. The beds contain chalk in places and are mostly of marine origin. The thickness is 1,000 feet in central Texas and reaches a maximum of 20,000 feet in Mexico. See CRETACEOUS SYSTEM.

Comayagua, *kō-mä-yä'gwä*, or **Valladolid la Nueva**, Honduras, C. A., a town, capital of the department of the same name, situated on the southern border of the plain of Comayagua, on the Humuya River, 220 miles east of Guatemala. It is the seat of a bishopric, has a large and handsome cathedral, a richly endowed hospital, several convents, and a college. It was founded by Alonzo Caceres in 1540, and up to 1827 was a thriving place, with about 18,000 inhabitants. In that year, however, it was burned by the monarchical faction of Guatemala, and has never recovered. Pop. 3,100.

Comb (A.S. *camb*), an instrument to separate and adjust the hair, too well known to need description. We have no certain authority that either the Greek or the Etruscan women applied this useful article regularly to their hair in the operations of the toilet; although it was used by the Greek women, at least, to arrange their hair. The combs used by the Greeks were of boxwood, and had teeth on both sides, while those used by the Egyptians had teeth only on one side. The Romans also had combs of boxwood, and at a later time probably of ivory and other materials. In the work of Guasco Delle Ornatrici there are several representatives of ancient Roman combs. One of them is a long one of box, of which the handle is overlaid with ivory, and appears to have been ornamented with a small meander in gold. It has two rows of fine teeth, delicately wrought and well proportioned. In making combs the material is first cut to the form which the comb is to have, and the teeth are then made all at once by means of circular saws mounted on the same axle and placed at a suitable distance from one another. Large combs in horn or shell, with wide teeth, are sometimes made with a punch, which cuts in the piece the teeth of two combs by the same operation. The teeth are afterward finished with the file. Combs made of vulcanized india-rubber, which are now so common, are made by pressing the caoutchouc while soft into molds, and then bringing them to the desired degree of hardness by the process of vulcanization. Canova and other modern sculptors have made great use of the comb, placed in the heads of their women, to which they add much grace and elegance.

Comb, the wax cavities in which bees lodge their honey. The comb of a bee is composed of hexagonal cells, of which there are two tiers, the cells in which are placed end to end, so that the three plates of wax, which serve as the bottom of the cell in the one tier, constitute also that of the corresponding one in the other. The mathematical problem in "maxima and minima," how to construct the greatest number of cells within the smallest possible room, and with the least expenditure of material, is solved. This the natural theologians and the older naturalists were accustomed to adduce, as one of an infinite number of proofs, that design and a Designer were displayed in nature.

Combaconum, *kōm-ba-kō'nūm*, Madras, British India, town in the district of Tanjore. It is regarded by the Hindus as a place of peculiar sanctity, and is inhabited largely by the Brahmans. It contains numerous pagodas and tanks with water, supposed to come from the Ganges River. It is one of the strongholds of Brahmanism, but a considerable number of the inhabitants are Roman Catholics, and a Protestant mission has been successfully established. Pop. 54,307.

Combat, Single, a very ancient usage, evidenced by Goliath (1 Sam. xvii.), and by Ajax in the 'Iliad.' The Norse practice of principals going alone to a small holm or island, to be free from disturbance while settling their quarrels by strength and skill, gave rise to the Saxon term *Holm-Gang*. In the days of chivalry the single combat received the strong support of law and custom, and was resorted to both in civil and in criminal cases. The accuser

COMBE — COMBINATION

or plaintiff swore to the truth of his tale, the other gave him the lie, a gage of battle was thrown down and taken up, and they fought it out under rules before an assembly, the supposition being that God would give victory to the right. The barbarous practice survives in European countries, without its excuse of superstition, in the modern duel, which is legally prohibited in the United States. In England it was still a legal method of trial well into the 19th century, but was abolished by statute 59 George III., cap. 48.

Combe, kōm or koom, Andrew, Scottish physiologist: b. Edinburgh 27 Oct. 1797; d. there 9 Aug. 1847. He was educated for the medical profession, and in 1822 he commenced practice at Edinburgh, and had considerable success. In 1838 he was appointed one of the physicians extraordinary to the queen in Scotland. His chief works are: 'Observations on Mental Derangement' (1831); 'Principles of Physiology' (1834); 'Physiology of Digestion' (1836); 'A Treatise on the Physiological and Moral Management of Infancy' (1840). Like his brother George (q.v.), he was a zealous phrenologist.

Combe, George, Scottish phrenologist: b. Edinburgh 21 Oct. 1788; d. Moore Park, Surrey, 14 Aug. 1858. He was a brother of Andrew Combe (q.v.), was bred to the law, and in 1812 admitted a member of the Society of Writers to the Signet. He was the first to introduce the doctrines of phrenology into Great Britain; and visited Germany and America, lecturing on his favorite science. He was also a zealous promoter of the cause of popular education and social progress; and was among the first to advocate compulsory education and the establishment of a board of health. Besides the 'Constitution of Man' (1828), which has had an enormous circulation, he was the author of: 'A System of Phrenology' (1825); 'Lectures on Popular Education' (1833); 'Moral Philosophy' (1840); 'The Life and Correspondence of Dr. Andrew Combe' (1850); 'Principles of Criminal Legislation and Prison Discipline Investigated' (1854); 'Relation Between Science and Religion' (1857).

Combe, William, English writer: b. Bristol 1741; d. Lambeth 19 June 1823. His 'Tour of Dr. Syntax in Search of the Picturesque' (1812), was once very popular. Other works by him: 'The Diabolical,' a poem (1776); 'The Devil Upon Two Sticks in England' (1790). After 43 years within the rules of a debtor's prison, and previous fortunes from officer to cook, he died in Lambeth.

Combermere, kōm'- or kūm'bēr-mēr, SIR Stapleton Stapleton-Cotton, VISCOUNT, English general: b. Denbighshire 17 Nov. 1773; d. Clifton 21 Feb. 1865. He entered the army in 1790, served in Flanders and India, and with the rank of major-general accompanied the Duke of Wellington to the Peninsula in 1808. At Salamanca, in 1812, he headed the brilliant cavalry charge which greatly contributed to the decisiveness of that victory, and was subsequently present at the battles of the Pyrenees, Orthez, and Toulouse. Shortly after the last battle he was raised to the peerage with the title of Baron Combermere. From 1817 to 1820 he was governor of Barbadoes; and in 1825 was sent to India as commander-in-chief

of the forces there, to put down the usurper Doorjun Sal. After a siege of less than two months, Bhurtpore, the chief city of Doorjun, was taken by storm on 6 Feb. 1826, for which Combermere was raised to the rank of viscount. The remainder of his life was passed in England. In 1852 he was appointed constable of the tower; and in 1855 made a field-marshal.

Combes, koomz, Justin Louis Emile, French statesman: b. Roquecourbe, Tarn, France, 6 Sept. 1835. He was educated in a Roman Catholic seminary for the priesthood, but subsequently studied medicine, and began practice in Pons, where he filled various posts of responsibility, such as those of mayor and county councilor. In 1885 he was elected to the Senate, of which he was vice-president 1893-4, becoming minister of public instruction in 1895. He has been active in the re-organization of primary and secondary education. In June 1902 he succeeded Waldeck-Rousseau as President du Conseil des Ministres. In this capacity he has enforced the Association Act, abolishing liberty of teaching in France and aimed at the clergy. His opponents have claimed that this has been done with needless severity. It has caused widespread disturbances throughout the country. On his becoming prime minister M. Combes announced his intention to reduce the period of military service to two years, and to establish a general income tax.

Combination, in mathematics, the selection, from a given set of objects, of a stated number without regard to their arrangement. Each combination can, by varying the arrangement of the constituent objects, be made to give rise to several permutations. Thus, of the four letters, *a, b, c, d*, four combinations, three at a time, are possible; namely, *abc, abd, acd, bcd*. Each of these combinations, however, produces six permutations, according to the order of the letters. For example, the combination *abc* yields the six permutations *abc, acb, bca, bac, cab, cba*. Thus, of the four letters *a, b, c, d*, the number of permutations three at a time is 24. It is easy to prove that the number of permutations of *n* objects two at a time is $n(n-1)$; three at a time $n(n-1)(n-2)$; four at a time $n(n-1)(n-2)(n-3)$; and so on, the number when *r* at a time are taken being $n(n-1)(n-2).....(n-r+1)$. The number of permutations of *n* things *n* at a time is therefore $n(n-1)(n-2).....4, 3, 2, 1$, a product usually represented by $|n$ or $n!$, and read as "factorial *n*." The theory of permutations and combinations is of very great importance in higher mathematics, and may be studied in any text-book of algebra, such as those by Chrystal, Todhunter, and Smith.

Combination, a union of individuals, companies, or corporations formed for the purpose of accomplishing a particular object or purpose. At common-law combinations were unlawful, but in the United States a combination is not unlawful in itself, though it becomes so if it seeks to obtain its ends in an unlawful manner. Combinations may be divided into two general classes, those formed by employees or "labor," and those formed by employers or "capital." Combinations formed by employees, or labor, are generally designated unions. The

COMBUSTION

purpose of a union is to better the condition of its members in relation to the work in which they are engaged, by securing higher wages, less working hours, different methods of doing the work, and similar changes. A union generally tries to enforce its demands by striking, or threatening to strike. A strike is a combination effected by employees whereby at a pre-arranged time they all stop working unless their demands are granted. A strike is usually organized through a union.

A boycott is a combination to cause a loss to a particular person by restraining others from doing business with that person. It is often so conducted that the person is affected socially as well as in his business. When a boycott has been declared against a person, any one having either business or social relations with that person is also boycotted.

When the objects of such combinations are effected in a peaceful and lawful manner there is no legal means by which they can be interfered with; but it generally happens that when a number of working-people strike there is a breach of contract or a conspiracy, in which case there is a legal redress. The usual action is for the injured party to proceed in equity and ask for an injunction restraining the former employees from committing certain acts. Sometimes damages are asked for, and it makes no difference what the status is when the cause is heard, as damages can be recovered for acts committed during a strike, although the strike may have ended long before the demand for damages.

Combinations formed by employers, or capital, are usually known as trusts. Trusts are generally formed with the object of regulating the supply or price of a product, or both, or for the purpose of reducing expenses or competition.

It is very difficult to frame a law which will be effective against all the different arrangements under which a trust can do business. The State courts have no jurisdiction outside the limits of the State to which they belong, and it is very seldom that a trust would be formed whose business would be confined to any one State. The Federal government has passed several anti-trust laws, and up to the present time the most effective way of dealing with this class of combinations is by laws passed under the clause in the Federal Constitution (Art. I., § 8, cl. 3), which provides that Congress shall have power "to regulate commerce with foreign nations, and among the several States, and with the Indian tribes."

In recent years a great many combinations called trusts have been formed, and one of the most recent instances is that of the Northern Securities Company, which was decided by the United States circuit court of appeals in April 1903. In this case there were two parallel and competing railroad companies doing an interstate commerce business. These roads were controlled by a very few people, and they formed a corporation called the Northern Securities Company, which gave its stock in exchange for that of the competing railroads. The result was that the Northern Securities Company owned the two competing roads, and it naturally follows that the roads would be run as one line instead of, as formerly, competing lines. The court decided that the anti-trust

laws covered such a case, and granted an injunction, declaring that the stock of the Northern Pacific Railroad and the Great Northern Railway companies (the two competing roads), held by the Northern Securities Company, was acquired in view of a combination among the defendants in restraint of trade and commerce among the several States, such as the anti-trust law denounces as illegal, and restrained the Northern Securities Company from exercising any control over either of the parallel and competing railroads.

Combustion. In consequence of the combination of the carbon and hydrogen in fuel with the oxygen of the air being the universal method of getting heat and light, and as when the action takes place the fuel is said to burn or undergo combustion, the latter term has been extended to those cases in which other bodies than carbon—for example, phosphorus, sulphur, metals, etc.—burn in the air, or in other substances than air—for example, chlorine. It is therefore but a special case of chemical action which, partly on account of its frequency and importance, partly on account of its obviousness, has attracted greater attention than the more recondite but not less potent manifestations of the same force. It is besides of peculiar interest in the history of chemistry, because all along it was felt to be of great importance to understand in what combustibility actually consists. The older chemists ascribed to bodies a combustible principle which assumed different shapes at different epochs, but continued till Lavoisier, in the end of the 18th century, pointed out the part which oxygen gas performs in the combustion of a body. One result of this was that the idea of a combustible principle quickly disappeared from chemical theory, and there grew up in its place a separation of bodies into combustibles and supporters of combustion, which is still retained in common language. The distinction, however, is accidental, for, as it requires the concurrence of a member of both classes to produce burning, it is plain that each must be regarded as supporting the combustion of the other; and it is experimentally possible to reverse the ordinary conditions, and exhibit that body as the combustible which is usually defined as the supporter of combustion, and as a necessary consequence the other acting as the supporter, which is usually regarded as a combustible.

For many years subsequent to Lavoisier his views were dominant, but increase of facts led to most important modifications of them. By degrees, combustion and oxygen, which was the chief element concerned, have lost their theoretical predominance, and have merged in ideas which are not limited to one set of actions, but which will ultimately attempt to comprise all the manifestations of chemical action in a general theory. See HEAT; LAVOISIER; METAL; OXYGEN; PHLOGISTON.

Combustion, Spontaneous, the ignition of bodies by the internal development of heat without the application of an external flame. It not infrequently takes place among heaps of rags, cotton, and other substances strongly lubricated with oil, when, if the oil is freshly made, it is very ready to combine with the oxygen of the atmosphere and give out carbon and hydrogen. The heat thus developed, diffusing itself through

COMEDIÉ FRANCAISE — COMENIUS

a mass of highly inflammable substances, will in certain circumstances be sufficient to set them on fire. A remarkable instance of spontaneous combustion among hemp was afforded in June 1861, being the cause of the terrible conflagration in Tooley Street, London. Bituminous coal, piled up in heaps, is apt to ignite by the decomposition of the sulphuret of iron which it contains. In ships laden with coal impregnated with sulphur and iron in the form of bi-sulphuret of iron (pyrites), decomposition of this substance is sometimes occasioned by the access of moisture, and heat is evolved to such a degree as to cause the combustion of the coal, especially if air is admitted freely. Water poured upon the burning material only adds to the intensity of the action. The most singular instances, however, of spontaneous combustion are those of which human beings become the victims in their own persons—if we really can believe that such cases have occurred. Those whom it is alleged to have befallen have been individuals grossly addicted to intemperance, fat, and advanced in years. The chemical changes producing such a result are not well understood, and from the difficulties attending its explanation some eminent chemists, such as Liebig and others, have been led to reject the theory altogether as untenable, and maintain that none of the instances adduced are well authenticated. Among other hypotheses regarding the origin of this extraordinary phenomenon, it has been surmised to be owing to the development of phosphuretted hydrogen, which takes fire on coming into contact with atmospheric air, and might be formed and exhaled under certain conditions from the living body. The proximate cause of the ignition appears always to have been some burning substance, such as a candle, the fire, or a spark from a tobacco-pipe. The flame in cases of human combustion is described as having been of a bluish color, faint, and extinguished with difficulty by water. It is said to be the trunk which is first consumed, the extremities being the last to be destroyed. Dickens, in his 'Bleak House,' has introduced a gruesome case of spontaneous combustion.

Comédie Française, kō-mā-dē frān-sāz, the official name of the national theatre of France which is supported from public funds, for the purpose of advancing dramatic art. After Molière's death, in 1673, the rivalries existing between the two factions into which his company of actors had divided, caused the decree of Louis XIV. of 21 Oct. 1680, that made this a national institution. This decree has remained in force with but slight modifications down to the present.

Comédie Humaine, ü-mān, La, a series of novels by Balzac, so classified by their author, and intended to form a picture of the manners and morals of the period.

Comedietta, kō-mā-dī-ēt'ta, a dramatic composition of the comedy class, but not so much elaborated as a regular comedy, and generally consisting of one or at most two acts.

Comedones, kōm'ē-dōnz, a name applied to the little cylinders of sebaceous and epithelial substance which are apt to accumulate in the follicles of the skin and to appear on the surface as small round black spots. When squeezed out they have the appearance of mi-

nute maggots or grubs with black heads, and thence have derived their name. They are generally associated with a weak state of the skin as well as of the individual. Generous diet and tonic treatment with soap-and-water cleansing and friction will be useful; as an astringent to invigorate a debilitated skin, a lotion of corrosive sublimate (two grains) in emulsion of bitter almonds (one ounce) and dilute alcohol will be effective. See ACNE.

Com'edy, a dramatic representation of a light and amusing nature, in which are satirized pleasantly the weaknesses or manners of society and the ludicrous incidents of life. Comedy took its origin in the Dionysian festivals, with those who led the phallic songs of the band of revelers (Gr. *kōmos*) who, at the vintage festivals, gave expression to the exuberant joy and merriment by parading about, dressed up, and singing jovial songs in honor of Dionysus. These songs were frequently interspersed with extemporized jokes at the expense of the bystanders. Comedy first assumed a regular shape among the Dorians. The first attempts at it among the Athenians were made by Susarion, a native of Megara, about 578 B.C. Epicharmus first gave comedy a new form and introduced a regular plot. That branch of the Attic drama known as the Old Comedy begins properly with Cratinus. It lasted from 458 B.C. to 404 B.C. The later pieces of Aristophanes belong to the Middle Comedy. The chorus in a comedy consisted of 24. The Middle Comedy lasted from 404 B.C. to 340 B.C., and the New Comedy till 260 B.C. Middle Comedy found its materials in satirizing classes of people instead of individuals. New Comedy answers to the comedy of the present day. The most distinguished of Roman comic writers were Plautus and Terence, whose plots were mainly derived from the Greek. See DRAMA.

Comedy of Errors, The, a play by Shakespeare, first acted at Gray's Inn 28 Dec. 1594. It is one of the shortest of the Shakespearean plays, and one of the very earliest written. The main story is from the 'Menæchmi' of Plautus, and the plot turns upon a series of mistakes caused by the wonderful likeness between two sets of twin brothers: Antipholus of Ephesus and Antipholus of Syracuse, and their two servants, each named Dromio. In recent years two American actors, Robson and Crane, have frequently presented the play with great success, their roles being those of the two Dromios.

Comenius, kō-mē'nī-ūs (originally **Komensky**), **Johann** (yō hān) **Amos**, Moravian educational reformer: b. Nivnitz, Moravia, 28 March 1592; d. Amsterdam 15 Oct. 1671. In 1616 he received an appointment as teacher in Fulnek, on the plunder of which by the Spaniards after the battle of Prague, in 1620, he lost all that he possessed, including his books and manuscripts. He then went to Poland, where, in 1632, he was elected bishop of the Moravian and Bohemian Brethren in Lissa. In 1631 he published his 'Janua Linguarum reserata,' a work translated into many European languages, also into Persian, Arabian, and Mongolian. In this he laid down a new system for teaching languages to children by the use of visible signs in order to facilitate the learning of words. His 'Orbis Pictus,' or the 'Vis-

COMET

ible World,' an abridgment of the 'Janua Linguarum reserata,' with the addition of a large number of cuts, was published in 1657. In the latter part of his life he gave himself up to religious dreams, after the fashion of that time, and revered Bourignon as a prophetess. Comenius' place in the history of education is now generally recognized. Consult Laurie, 'John Amos Comenius' (1881); Payne, 'Lectures on the History of Education' (1892).

Comet (Greek, "hair," alluding to the luminous appendage or tail with which the brighter comets are always associated, and which formerly won for them the name of "hairy stars"). Comets may for convenience be divided into two classes, periodic and unexpected. From 2 to 3 of the former, and from 3 to 4 of the latter, appear on the average every year, but the number varies greatly. In 1898 as many as 10 were discovered, 5 being found in 12 days. Of the 10, 7 were unexpected.

Every comet, no matter how magnificent it may subsequently be, when first discovered, if remote from the sun, appears as a small, very faint, hazy ball. As it comes nearer it becomes brighter, and generally larger, although sometimes it contracts in size. If it is going to be a fine comet it gradually lengthens out, and develops a short tail. The tail rapidly brightens and lengthens as the comet approaches perihelion, as the point in its orbit is called when it is nearest the sun. If the earth is favorably situated the comet appears at its best a few days after the passage of perihelion, and then gradually fades out and disappears as it came. About one unexpected comet in five is visible to the naked eye. The periodic comets move in elliptical orbits about the sun in planes not in general greatly inclined to the ecliptic. The longest period so far definitely known, that of Halley's comet, is 76 years. The unexpected comets have still larger orbits, lying in all planes, with much longer periods. Many of them have a retrograde motion, and occasionally one visits the sun never again to return to it. When an unexpected comet arrives, its orbit is first computed from three observations made on different nights, on the assumption that it is moving in a parabolic orbit. If we are able to observe it through a long period we frequently find that its path differs slightly from a parabola. It is not likely that any comet moves in an exact parabola. If it moves a little slower than the parabolic velocity, its orbit is an ellipse, and the comet really becomes periodic, although it is not classed as such until it has been certainly identified at another return. If it moves a little faster than the parabolic velocity, its orbit is a hyperbola, and the comet will recede into space never to return.

Should a comet happen to pass near one of the larger planets, its orbit may be somewhat changed by the approach and its speed may be either increased or diminished. In this manner new members of the periodic class of comets are from time to time added to the list. On the other hand, its velocity may be so far accelerated as to change its orbit, or even drive it out of our system, never to return to it. In this way some of the members of our periodic family of comets are subject to change; others, however, have apparently come to stay for good. Out of 33 well-known periodic comets 24

have, or did have, periods lying between five and nine years. Many of these were doubtless brought into our system by the giant planet Jupiter. Some of them have already disappeared, owing to a change in their orbits, while some have lost a large part of their gaseous constituents and thus become invisible.

This last statement naturally brings us to the question, What is a comet? In early times they were supposed to be objects within our own atmosphere, presaging famines, wars, and the death of kings. It was first shown by Tycho Brahe that they were celestial bodies independent of the earth, and Newton proved that, excepting their tails, they were bodies subject to the law of gravitation. In the middle of the last century it was shown by H. A. Newton, Schiaparelli and others that our chief meteoric showers, those of 10 August and 14 November, were due to great swarms of meteoric bodies moving in elliptical orbits, practically coincident with the orbits of two well-known periodic comets, 1862, III. (Tuttle's), and 1866, I. (Tempel's).

In several instances two or more comets are known to be following practically the same path, and it was but a step from this to see that the head of a comet was only a concentrated swarm of meteors. It is only within the last few years, however, that we have begun to understand the nature of a comet's tail. That it is matter in a state of extreme tenuity is obvious, since, when millions of miles of it is interposed between us and the faintest stars, they are still visible and practically undimmed. What has puzzled astronomers since the time of Newton, however, is the fact that while all other bodies in the sidereal universe, as far as we are aware, obey the law of gravitation, comets' tails are clearly subject to some strong repulsive force, which drives the matter composing them away from the sun with enormously high velocities. The tail, therefore, always lies outside of the comet's orbit, being somewhat behind the comet when the latter is approaching the sun, and somewhat in advance of it when the comet is receding.

That the tail is gaseous is proved conclusively by the spectroscope, also that it is in an extremely rarified condition; but why the extremely small particles which constitute a gas should act in any way differently under the law of gravitation from the larger meteoric masses which constitute the head of the comet is not at first sight obvious. If, however, we consider the matter carefully, we shall see that if all objects are attracted to the sun in proportion to their mass, and repelled from it in proportion to their surface, then the attraction will vary as the cube of the diameter of the objects and the repulsion as the square. For objects of ordinary size the repulsion is so slight that we cannot detect it; but if the object becomes gradually smaller, the attraction of the mass will diminish much more rapidly than the repulsion on the surface, and a time will come when they will be equal, and if the particle becomes still smaller, the repulsion must exceed the attractive force. It therefore becomes evident that if such a repulsive force existed, and if the gaseous molecules were sufficiently small, we should have an effect exactly like that which we observe.

It has been shown by J. J. Thomson ('Proceeding of the Royal Society,' LVIII. No. 356)



THE COMET OF 1882.

COMET

that if hydrogen gas is electrified positively, the green line in its spectrum will be brighter than the red, and, on the other hand, if negatively charged, the red will be brighter than the green. In the case of the sun the red is the brighter line, so that we may infer that the solar surface is charged negatively.

It is a well-known fact that if the ultra-violet rays of the spectrum be allowed to fall upon a metallic body little corpuscles or electrons leave the atoms forming the metallic body and fly away from them with enormous velocity. These corpuscles either carry a negative charge of electricity, or what is perhaps more probable, constitute the negative electricity itself. The atoms lacking these corpuscles are as we usually express it positively charged.

Surrounding the meteor swarm and with it forming the comet's head is a mass of gas. When a flying corpuscle comes in contact with a molecule of this gas the two unite, the molecule becomes negatively charged, and both being repelled by the negatively charged sun, recede from it. The subject will be found treated in more detail by R. A. Fessenden, ('Astrophysical Journal,' III., 36. He there computes the potential of the sun's surface at about 15,000 volts. According to Arrhenius and Thomson the corpuscles which constantly deliver a negative charge to the earth, and would therefore also deliver it to a comet, proceed directly from the sun. The tail probably receives a charge from both these sources, but the latter would seem to be much the more effective of the two.

The question may now naturally be asked, since there is an abundance of extremely rarefied gas at an altitude of a few hundred miles above the earth's surface, and since we too are exposed to the flying corpuscles, why is not the earth itself provided with a comet-like tail? In answer we reply that at certain times it is. ('Annals of Harvard Observatory,' XXXII., 288. Our great auroras are indeed nothing else than the appearance of a small cometary tail. These great auroras, which exist at an altitude of several hundred miles, and envelope the whole earth, must not be confounded with the small but intensely brilliant local auroras always existing at low altitudes in the polar regions.

The reason that these great auroras only reach an altitude of a few hundred miles, instead of several millions, like the tail of a comet, is on account of the great mass of the earth, which does not permit the electrified gases to escape from it. The great auroras exhibit two notable characteristics. They appear only when the electro-magnetic condition of the sun is greatly perturbed, and they are most conspicuous at those times when the earth is approaching or receding most rapidly from it; that is, at the end of March and September. The same appears to be true of comets. The longest tails belong to those comets that approach closest to the sun's surface, and accordingly approach and recede from it with the greatest rapidity. Of the comets that do not approach remarkably close to the sun's surface, those which come during years of great solar activity are more likely to be provided with long tails than those coming when the solar surface is quiescent. Of the past 62 years during which sun spots have been recorded, 31 have been classed as of greater, and 31 as of less solar

activity. If the sun's activity had no influence upon a comet's tail, we should expect that an equal number of comets provided with long tails would have appeared in each of these intervals of 31 years. During the 62 years 10 comets have appeared that were furnished with long tails, and yet did not pass within 10,000,000 miles of the sun's surface. Of these, 7 came during the years of great solar activity, and only 3 during those of less. From this we see that comets' tails, like our auroras, other things being equal, appear to be more pronounced during years of great solar activity.

Since the electric current spreads out from the nucleus on all sides as it recedes from the sun, there must, by the well-known laws of currents, be a rotation produced by the magnetic force of the sun acting upon the current ('Annals of Harvard Observatory,' XXXII., 275). The tendency would be for the tail to revolve about its axis, in one direction, if located north of the sun's magnetic equator, and in the other direction if located south of it. Such a rotation has in fact been observed in the case of the bright comets of 1825 IV., 1835 III. (Halley's), and 1892 I. (Swift's).

Quite recently another explanation of comets' tails has been given by Arrhenius. He attributes the recession of the particles forming the tail, however, to the repulsion of light. It was first shown mathematically by Maxwell that light must exert a slight mechanical pressure upon all bodies above a certain size that are exposed to it. Gaseous molecules are too small to be affected by it. In the case of large bodies it would be concealed by the overwhelming attraction of gravitation. In order to be repelled from the sun, particles having the density of water must have diameters lying between 1-1000 and 1-14000 of a millimetre, or between 1-25000 and 1-350000 of an inch. For particles of greater specific gravity the dimensions will have narrower limits.

It is most likely that several causes combined produce the observed repulsion of the tail. Several of these are suggested by Nichols and Hull in their article describing their attempt to produce an artificial cometary tail ('Astrophysical Journal,' 1903, XVII. 352). It was shown in the 'Harvard Annals,' XXXII., 288, that the gaseous spectrum persisted in the tail of Swift's comet to a distance of 3,000,000 miles from the head. The presence of dust would be indicated by reflected light giving the solar spectrum. On account of the faintness of the tail we should hardly expect to distinguish the solar lines, but a distribution of photographic intensity in the spectrum similar to that which we find in the sun might be accepted as evidence of the presence of dust in the tail. Such a distribution was found in the case of the bright comet of 1881 III.

We may therefore say that the most probable explanation of a comet is that the head consists of a more or less concentrated swarm of meteors enveloped in gas and dust and that the tail is a current of gas and sometimes dust proceeding from the head, being most pronounced when the comet crosses the greatest number of electro-magnetic equipotential surfaces.

The shape and size of the tail enable us to compute the intensity of the repulsive force causing the tail to recede from the sun. This

COMET

was done by Bredichin, who divided all comets' tails into three classes according to the sharpness of their curvature, and suggested that the sharpness of the curve indicated the atomic weight and therefore the general chemical constitution of the matter forming the tail. This last suggestion is open to doubt.

More recently, by means of photography, we have been enabled to detect condensed areas in the tails of certain comets, and by comparing the photographs upon successive nights we have measured directly the speed of recession of the particles forming the tail from the head of the comet. Two comets so far have been measured in this manner that of 1892 I. (Swift's), by the writer, and that of 1893 II. (Rordame's), by Hussey. For the comet of 1892 the repulsive force was 39.5 times that of gravity. In the case of the comet of 1893, the repulsive force was 36 times as great ('Pub. Astron. Soc. Pac.,' VII., 185).

Since the gaseous particles receding from a comet's head can never again return to it, and since a comet is visible to us chiefly, and generally wholly, by the electrical illumination of this gaseous medium, it is clear that a comet must become less and less luminous after each return to the sun. But not only does it become less luminous on account of the loss of the material forming its tail, but the meteors composing its head likewise become more and more widely distributed along the course of its orbit. This is in part due to the positive charge left by the tail, which neutralizes the gravitation—or pull of the various portions of the comet's head for one another—and therefore permits those portions of the meteoric swarm which are nearest to the sun to move at a higher speed than those portions which are more remote.

In some cases, like our August meteors, the distribution extends throughout the orbit, with but one luminous condensation, known as the comet of 1862 III. In some cases there are two or more condensations. Thus Biela's comet was seen to split into two parts. Four distinct comets were found following in the track of the great comet of 1668.

We must now discuss the important question, what is the origin of comets? It is known that the sun, with its attendant planets, is traversing space in the direction of the constellation Lyra at a speed about 12 miles per second. If comets come from remote interstellar space, or from the other stars, it is obvious that we should meet more comets coming from Lyra than would overtake us coming from the opposite direction. Also that those comets we met would have a greater velocity relative to the sun than would those that might overtake us. Nothing of the sort is found, however—the distribution is uniform in all directions. There is but one conclusion to be drawn from this, and that is that all the comets that we have observed possess the same common speed as the sun, omitting relative motion, and travel in the same direction. In short, they are all of them parts of the same original gaseous mass from which the solar system condensed, being merely those portions which were originally left on the outside, before the great common rotation was established, and which now occasionally drop in toward the centre, and then fly back again to their original position on the outskirts of the system. The normal path of every comet is therefore an

ellipse. If the paths of some comets have become slightly hyperbolic through the action of some outside body, they can never again visit the sun. As we have just seen, a comet not belonging to our system would be most likely to approach us from the general direction of the constellation Lyra, with a high hyperbolic velocity. We are acquainted with the orbits of about 400 comets, but no such body is found among them.

From this point of view it is interesting to determine of what chemical elements comets are composed. To this the spectroscope gives a ready answer, and shows that by far the most common elements are hydrogen and carbon in chemical combination. This answer, however, is only a partial one, because most comets do not approach sufficiently near to the sun to enable their more refractory elements to be volatilized. The bright small comet of 1882 I. (Wells') approached so close to the solar surface that the distance at perihelion amounted to only about 5,000,000 miles. Some of its metallic constituents were accordingly vaporized, the most prominent of them being sodium. The great comet of 1882 III. approached within 300,000 miles of the sun's surface. This was so near that not only the sodium, but even some of the iron lines appeared in its spectrum. This is what we should have expected, judging by the chemical composition of most of the meteors that reach the earth's surface. We thus see that incidentally comets are able to give us information regarding the temperature that bodies would attain at different distances from the sun. When the metallic lines are present in the spectra of these comets the carbon bands vanish. This is precisely the effect that is produced in our laboratories when the cause of the illumination is an electric current. The current by preference selects the molecules which are the best conductors. If the illumination of the comet were due merely to heat, there is no reason why the carbon bands should have disappeared.

Few persons now living remember distinctly the great comet of 1843. It appeared suddenly in the northern hemisphere about the middle of March, and was not long visible. It was notable for the great length of its tail and its small perihelion distance,—the smallest on record. This amounted to only 511,000 miles. Its centre therefore came within 78,000, and the nearer side of its head within 32,000 miles of the sun's surface.

The great comet of 1858, known generally as Donati's, was a magnificent object. Not only was it a fine comet in itself, but it seems as if everything conspired to enable it to be well seen from the earth. It was a most conspicuous object in the northern sky during the early evenings in October, and was nearest us shortly after the passage of perihelion. Its tail reached a length of 60° and swept as a broad curved plume across the heavens. It was visible for several months, which enabled it to be carefully observed, and there is no doubt but that it moves in an elliptic orbit. Its period is about 2,000 years.

The great comet of 1861 was discovered by Tebbutt in Australia. It appeared suddenly in the northern hemisphere at the end of June and, according to Sir John Herschel, was the brightest comet of the century up to that time. It was not long visible.

COMET

The great comet of 1882 was remarkable on many accounts. In the first place it was shown to be one of a group of five comets all following nearly in the same orbit. The four others were those of 1668, 1843, 1880, and 1887. The last was comparatively inconspicuous, but the others were all notable. The nucleus of the comet of 1882 moreover showed a tendency to fall apart, five different condensations in it being visible at once. Schmidt, Barnard, and Brooks all noticed small companion nebulosities in the immediate vicinity of the comet and moving with it. It was visible for about nine months—an unusually long interval, and in this time it traversed 340° of its orbit. It clearly follows an elliptical path with a period which lies between 772 and 1,000 years. The tail was very extraordinary. It measured about 200,000,000 miles in length, and was strongly forked at the end. Moreover it was accompanied by a clearly seen but filmy sheath of light, extending 3° or 4° towards the sun. The whole comet was surrounded by an elliptical envelope of enormous dimensions and of a still more filmy nature. That this most remarkable object was not more generally observed by the public is due undoubtedly to the fact that it was visible only in the early morning hours. It was certainly the brightest comet of the century, and it was so bright that it was watched in perihelion passage until in contact with the sun's limb, when it suddenly disappeared, being of too filmy a nature to be detected upon the sun's surface. For three days it was visible to the naked eye with the sun above the horizon. There have been so far 14 different comets placed on record which were bright enough to be seen under these circumstances.

Turning now to the periodic comets; by far

appearance it was considered to be the precursor of the conquest of England by William of Normandy. It was a magnificent object in 1145, and again in 1223, when it was supposed to foretell the death of Philip Augustus of France. In 1456 it was a superb object appearing shortly after the Turks had taken Constantinople. In 1682 it was observed by Halley, who computed its orbit, and showed that it was identical with the great comets of 1531 and 1607, and predicted its return for the end of 1758 or the beginning of 1759. This is the first time that the return of a comet was ever predicted, and although Halley knew that he could not expect to live to see his prediction fulfilled (he was born in 1656), yet he left a somewhat plaintive appeal to posterity, that in case the comet should reappear, it should be remembered that this first prediction was made by an Englishman. The comet appeared Christmas day 1758. At its next appearance, in 1835, the comet was a fine object, but did not correspond in brilliancy to the descriptions of some of its earlier apparitions. This may perhaps be explained by the fact that it was but two years after a sun-spot minimum. Its next appearance is scheduled for 1911 or 1912, also unfortunately very near a sun-spot minimum. But very likely the chief reason for its relative faintness in 1835 is that the material which formed the tail has been largely used up by its frequent visits to the sun, and that it will thus never again present the brilliancy of its past appearances.

The following table of the elements of the orbits of the periodic comets has been condensed and brought up to date (1 Jan. 1904) from Holden's tables of periodic comets given in the 'Encyclopedia Britannica':

TABLE OF THE MOST IMPORTANT PERIODIC COMETS.

T				ω	Ω	i	q	a	U	e	
1901	II.	Sept.	15.....	184°	335°	13°	0.34	2.22	3.30	0.85	Encke.
1899	IV.	July	28.....	186	121	13	1.35	5.28	5.28	0.54	Tempel II.
1884	II.	Aug.	16.....	301	5	5	1.28	3.08	5.40	0.58	Barnard.
1879	I.	Mar.	30.....	15	101	29	0.59	3.10	5.47	0.81	Brorsen.
1891	V.	Nov.	15.....	107	296	5	1.09	3.13	5.53	0.65	Tempel—L. Swift.
1886	IV.	June	7.....	177	54	13	1.33	3.15	5.60	0.58	Brooks.
1898	II.	Mar.	20.....	173	101	17	0.92	3.24	5.72	0.72	Winnecke.
1894	IV.	Oct.	12.....	297	49	3	1.39	3.25	5.86	0.57	De Vico—E. Swift.
1879	III.	May	7.....	160	79	10	1.77	3.30	5.98	0.46	Tempel I.
1892	V.	Dec.	11.....	170	207	31	1.43	3.38	6.23	0.58	Barnard.
1890	VII.	Oct.	26.....	328	45	13	1.97	3.45	6.40	0.47	Spitaler.
1896	VII.	Nov.	25.....	164	247	14	1.11	3.46	6.44	0.68	Perrine.
1896	V.	Oct.	26.....	140	192	12	1.48	3.50	6.55	0.58	Giacobini.
1852	III.	Sept.	23.....	223	246	13	0.86	3.53	6.62	0.76	Biela (I. and II.).
1893	III.	July	12.....	316	52	3	0.99	3.53	6.62	0.72	Finlay.
1897	II.	May	24.....	173	146	16	1.32	3.55	6.68	0.63	D'Arrest.
1898	IV.	July	5.....	173	206	25	1.60	3.60	6.82	0.56	Wolf.
1900	III.	Nov.	28.....	172	196	30	0.93	3.62	6.66	0.74	Giacobini.
1899	II.	Apr.	28.....	14	332	21	2.14	3.62	6.87	0.41	Holmes.
1895	II.	Aug.	21.....	168	170	3	1.30	3.68	7.06	0.65	L. Swift.
1896	VI.	Nov.	4.....	344	18	6	1.96	3.69	7.10	0.47	Brooks.
1894	I.	Feb.	10.....	46	84	6	1.15	3.80	7.42	0.70	Denning (II.).
1896	II.	Mar.	19.....	201	210	11	1.74	3.85	7.57	0.55	Faye.
1889	VI.	Nov.	30.....	70	331	10	1.35	4.18	8.53	0.68	L. Swift.
1831	V.	Sept.	13.....	312	66	7	0.72	4.23	8.69	0.83	Denning (I.).
1899	III.	May	4.....	207	270	54	1.02	5.74	13.66	0.82	Tuttle.
1866	I.	Jan.	11.....	171	231	163	0.98	10.32	33.18	0.90	Tempel.
1867	I.	Jan.	20.....	358	78	18	1.58	11.71	40.09	0.86	Stephan.
1852	IV.	Oct.	13.....	57	346	41	1.25	15.44	60.7	0.92	Westphal.
1884	I.	Jan.	26.....	199	254	74	0.78	17.2	71.56	0.96	Pons-Brooks.
1887	V.	Oct.	8.....	65	84	45	1.20	17.4	72.65	0.93	Olbers.
1846.	IV.	Mar.	6.....	13	78	85	0.66	17.90	75.7	0.96	De Vico.
1835	III.	Nov.	16.....	111	55	162	0.59	17.99	76.29	0.97	Halley.

the finest is Halley's. Our first record of it is in the year 11 B.C. Since then it has appeared regularly every 76 or 77 years, in all 25 times. We have a drawing of it as it appeared in 684, and another drawing of it in 1066. During its latter

The question is often asked the astronomer, what would happen if the earth should come into collision with a comet? As far as the tail is concerned, that is probably a frequent occurrence. It happened twice during the last

COMET — COMFORT

century, in the case of the comets of 1819 II. and 1861 II., but in neither case was it known until after the encounter had occurred. Should we come into contact with the head of a small comet there would undoubtedly be a fine meteoric display. That is in fact what probably happened in 1833, and also on a number of previous occasions, notably in 472, 902, 1029, 1202, and 1799, although the comet itself was not luminous. If the comet were moving rapidly with regard to the earth, as in these cases, the meteors would be consumed at a great altitude in our atmosphere, and no harm would be done. If the comet were moving in the same direction as ourselves, however, and at about the same speed, the matter would then become more serious, as many of the meteors might reach the earth's surface.

The self-luminous, and therefore visible comet, which has come nearest to the earth, as far as we are aware, was that of 1770 I. (Lexell's). It approached within 1,400,000 miles, or six times the distance of the moon. Its head appeared about four times the diameter of the moon, but its mass was imperceptibly small. Should the earth strike the nucleus of a great comet, like that, for instance, of 1858, it is impossible to foretell what would happen, but possibly the temperature and shock would be such that all life within several thousand miles of the point of contact would become extinct. Considering the vast recesses of celestial space, however, and the insignificant size of our earth, the probability of such an encounter may well be likened, as someone has suggested, to the chance that if a man should shut his eyes and fire a gun into the air, he would bring down a bird.

For a more detailed account of the individual peculiarities of the more interesting comets, see Clerke's 'History of Astronomy'; Chambers' 'Handbook of Astronomy.'

WILLIAM H. PICKERING,
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Comet, in ornithology, one of a group of humming-birds with long forked tails. One of the most imposing of all humming-birds is the Sappho comet (*Cometes Sappho*), or bar-tailed humming-bird, native to Bolivia, but migratory, and in the winter generally visiting eastern Peru. Specimens are secured only with great difficulty, owing to the rapidity of the complex evolutions of the bird when on the wing. Mounted examples, gorgeous as they are, do not convey an adequate idea of the brilliancy of the plumage. The Phaon comet (*Cometes Phaon*) is equally magnificent, but larger, inhabiting also Peru and Bolivia. It is distinguished from the Sappho comet by the fact that the tail is wholly crimson red, while that of the Sappho comet is ruddy brown at the base and is tipped with a black band. See HUMMING-BIRDS.

Comet-seeker (also called COMET-FINDER), a telescope of low power but optically so contrived as to have a wide field, used in searching for comets.

Cometas, called SCHOLASTICUS, Greek author, generally assigned to the 9th century A.D., although his time is doubtful. There are extant of his works a paraphrase of part of the eleventh chapter of Saint John's Gospel, in 57 hexameter verses, and six epigrams in the Greek Anthology. It appears from some of these epi-

grams that he made a new recension of the Homeric poems, effecting radical changes for the better in the punctuation. Clemens Alexandrinus refers to a Cometas of Crete as a commentator on Homer. By some he has been identified with the Cometas who was made professor of grammar at Constantinople in 856.

Comète, Pensées sur la, a work by Pierre Bayle, published in 1682, on the occasion of the appearance of the comet of 1680. It is a discussion of various questions of metaphysics, morals, theology, history, and politics, and is written with a boldness of thought unusual in those times. Its general thesis is that atheism is less to be feared than idolatry and superstition.

Comettant, Oscar, French musician, composer, and author: b. Bordeaux 18 April 1819; d. Montivilliers 1898. He was a pupil of Elwart and Carafa at the Conservatoire, and first became known as a pianist; he also wrote several works for the piano, duets for violin and piano, and choruses and songs. Among the piano compositions were 'Robert Bruce' and 'Le Juif Errant'; the vocal included 'L'Alboni' and 'L'Inde Révoltée.' For many years he was musical critic of the *Siècle*, and he was also a contributor to the 'Ménestrel,' the 'Gazette Musicalé,' and other journals of music. A great traveler, he visited the United States and wrote a book of impressions, 'Trois Ans aux Etats-Unis' (1857). Among his further works, most of which are marked by a humorous and brilliant style, are: 'Les Civilisations Inconnues' (1863); 'Le Danemark tel qu'il Est' (1865); 'La Musique, les Musiciens, et les Instruments de Musique' (1870); and 'Francis Planté' (1874).

Comez, or Comes, Juan Baptista, Spanish composer: b. province of Valencia about 1560. He was director of the music at Valencia in the Cathedral and in the Church del Patriarca. His reputation in Spain is very high. His compositions are preserved in manuscript at the Escorial and various churches. A two-volume collection of them appeared at Madrid in 1889.

Comfort, Samuel, American manufacturer: b. Morrisville, Bucks County, Pa., 5 May 1837. He enlisted for the Civil War in an independent cavalry company, subsequently recruited and equipped a cavalry company, and in 1865 was made major and mustered out. After the war he became interested in petroleum refining at Titusville, Pa., his business finally being merged with the Standard Oil Company. He was made representative of the company in western India, with headquarters at Bombay. In 1894-6 he was United States vice-consul, and in 1896-8 consul, at Bombay. He patented several mechanical devices.

Comfort, George Fisk, American scholar and educator: b. Berkshire, Tompkins County, N. Y., 20 Sept. 1833. Graduated from Wesleyan University in 1857, he studied archæology and the history of the fine arts in Europe, in 1865-8 was professor of modern languages and æsthetics in Allegheny College (Meadville, Pa.), and in 1868-72 lecturer on Christian art and archæology in the Drew Theological Seminary (Madison, N. J.). In 1872 he was appointed professor of modern languages and æsthetics in the newly-established Syracuse University, where he organ-

ized the college of fine arts, of which he was dean from 1873 to 1893. He organized the Syracuse Museum of Fine Arts in 1896, and became its director. He was also one of the chief organizers of the American Philological Association, and from 1869 to 1874 its secretary. From 1872 to 1893 he was editor of the art department of the 'Northern Christian Advocate.' He has also contributed extensively to periodicals, and published 'Art Museums in America'; 'Modern Languages in Education,' and other works.

Comfrey, kŭm'fri, the common name of the genus *Symphytum* of the natural order *Boraginaceæ* or *Borage* family. There are about 15 species, all natives of the Old World, where they are used in household medicine or for forage plants. Attempts have been made to naturalize them in America for commercial purposes, but the experiments have not given much promise of success. There is but one American species growing wild, *S. officinale*, naturalized from Europe or Asia. It is a coarse perennial weed, from two to three feet high, with flowers in long racemes. The roots are mucilaginous, and are supposed to have medicinal virtues as a cure for diarrhœa. It is known also as blackwort, bruisewort, and boneset. In England the leaves, gathered while young, are sometimes used as a substitute for spinach, and some people of unrefined taste eat the young shoots after blanching them by forcing them to grow through heaps of earth. Comfrey stewed in sugar, with a small amount of paregoric added, makes a highly prized domestic remedy for coughs and bronchial irritations.

Comines, kō-mēn, **Commines**, or **Comynes**, **Philippe de**, French statesman and historian: b. Comines near Lille 1445; d. Argenton 18 Oct. 1509. He stood high in the favor of Charles of Burgundy, afterward Charles the Bold, and on occasion of Louis XI.'s imprisonment by Charles at Péronne, succeeded in bringing about a treaty of peace between them. In 1472 he forsook the cause of the Duke of Burgundy and became councilor and chamberlain of Louis XI., who compensated him so amply for the loss of his property, which had been confiscated by Charles, that he soon became one of the most wealthy and influential noblemen in France. The death of Louis, however, proved fatal to his fortunes. He was no favorite with Anne de Beaujeu, the regent, and was imprisoned on a charge of conspiracy against her. On the accession of Charles VIII., however, he was again employed in the public service, but went into retirement after the advent of Louis XII., who seemed reluctant to favor him, although he left him in possession of a pension. The fame of Comines rests not only upon his astuteness as a statesman, but still more upon his 'Mémoires,' which give a complete view of the political affairs of his time, and present a vivid picture of the character of Louis XI. They have been frequently printed. Lenglet Dufresnoy's edition (London 1747), is still sought for, especially on account of its annotations; but the best are those published by Mlle. Dupont (Paris 1840-7); and Chantelauze (1881). Comines figures in Sir Walter Scott's romance of 'Quentin Durward.'

Coming Race, The, a story by Edward Bulwer-Lytton, published in 1871. It was a skit at certain assumptions of science; but its clever invention and brilliant treatment, added to the

craving wonder of humanity as to what its evolution is to be toward, gave it a large popularity.

Comitat, kōm'ī-tat (L. *comitatus*), which means county, the name given to administrative districts of some size into which Hungary and Transylvania are divided.

Comitia, kō-mīsh'ī-ā, with the Romans, the assemblies of the people in which the public business was transacted, and measures taken in conformity with the will of the majority. They existed even under the kings. In the time of the republic they were convoked by the consuls; in their absence often by the dictator, the tribunes, and in extraordinary cases even by the pontifex maximus. There were three comitia among the Romans, which were called *comitia curiata*, *comitia centuriata*, and *comitia tributa*. The oldest of these was the *comitia curiata*, so called because in it the people voted by *curiæ* or wards. It consisted exclusively of the patricians, the original ruling class at Rome, and the class to which the name of *populus* was at first restricted. They were divided into three tribes, the *Luceres*, *Rammes*, and *Tities*, each of which was divided into 10 *curiæ*, so that there were 30 *curiæ* who voted in the *comitia curiata*. The *comitia centuriata* was a mixed assembly of the patricians and plebeians, in which the people voted by centuries, as these had been formed by Servius Tullius. On the institution of this comitia the principal privileges of the *comitia curiata* were transferred to it, and in course of time the functions of the latter became a mere formality, so that even before the time of Cicero these were not performed by the *curiæ* themselves, but by 30 lictors representing them. The rights of the *comitia centuriata* were thus very important, comprising the right of electing the higher magistrates, the right of passing or rejecting laws proposed to them, the right of deciding upon war on the ground of a *senatus consultum* or decree of the senate, and the highest judicial power. This comitia could be held only on certain days, and it must be summoned 17 days before the day of meeting. On the day of the comitia itself the presiding magistrate, with an augur, went into a tent before the city in order to observe the auspices. If the augur declared them unexceptionable, the comitia was held; if not, it was postponed to another day. Before sunrise and after sunset no business was transacted in the comitia. The presiding magistrate, on his curule chair, opened the assembly by a prayer, which he repeated after the words of the augur. In earlier times, first the equites, then the centuries of the first class, etc., were called upon to vote. In later times lots were cast for the order of voting. The opinion of the century which first voted was usually followed by all the rest. In the earliest times every century voted verbally; in later times by ballot. What was concluded in each century by the majority, was proclaimed by the herald as the vote of this century. The comitia was interrupted if any one in the assembly was attacked by a fit of epilepsy (which was called for this reason *morbus comitialis*), or if a tribune of the people pronounced his veto, and under some other circumstances. The other comitia, the *comitia tributa*, which was also an institution of Servius Tullius, was essentially plebeian in its nature, for if the patricians were not, as some

COMITLAN — COMMANDITE

think, entirely excluded from it, they were in so small a minority that their influence was scarcely felt. It was based upon the division which Servius Tullius made of the whole Roman territory into 30 local tribes, which were afterward increased to 35. Its power was at first very limited, being merely local, but it gradually increased, so that it in the end it came to possess the right of exercising electoral, legislative and judicial functions, though not so extensive as those of the *comitia centuriata*. It had the right of electing only the inferior magistrates; legislatively, it was merely entitled to pass resolutions proposed by the tribunes, which before becoming law had to be sanctioned by the senate; judicially, it had the right of trying only those who had committed offenses against the majesty of the people, and the only punishment it could inflict was a fine. It might assemble either within or without the walls of the city, but not at a greater distance than 1,000 paces, which was the limit of the power of the tribunes. The *comitia centuriata*, on the other hand, always met in the Campus Martius. Sometimes the *comitia centuriata* was mixed with the *comitia tributa*, but in what manner it is not known. The emperors retained these assemblies for the sake of appearance, but used them only as instruments for the accomplishment of their purposes.

Comitlan, *kō-mēt-län'*, or **Comitan**, *kō-mē-tän'*, Mexico, a town in the state of Chiapas, on the Grijalva River, 35 miles south-east of Ciudad Real. It has a magnificent church, and is a place of considerable trade. It is supported chiefly by contraband trade, as the duties on foreign goods are excessive. Pop. 10,000.

Comitium, a square in the ancient city of Rome between the Curia and the Forum, where the *comitia curiata* (q.v.) met. It contained the original rostra or speakers' platform.

Com'ity of Nations (more frequently mentioned by its Latin equivalent, *comitas gentium*), the international courtesy by which effect is given to the laws of one State within the territory and against the citizens of another State. "In the silence of any positive rule," says Story, "affirming, or denying, or restraining the operation of foreign laws, courts of justice presume the tacit adoption of them by their own government, unless they are repugnant to its policy or prejudicial to its interests." Consult Story, 'Conflict of Laws.'

Comma, the stroke or mark used in writing and printing to separate from each other phrases and clauses in a sentence. The word is of Greek origin and is the noun of the verb *kopto*, to cut; hence literally comma is section, and in grammatical works written in Greek and Latin *comma* or its diminutive *kommation* means a clause in a period as well as the punctuation mark, and in prosody the *cæsura*. In German typography the punctuation mark comma is a downward short stroke from right to left (/).

Comma Bacillus. See CHOLERA.

Commagene, *kōm-a-jē'nē*, in ancient times a district in the north of Syria, bounded on the east by the Euphrates, on the north by Mount Amanus, and on the west by Cilicia, for some time attached to the kingdom of the Seleucidæ, but afterward for more than 100 years an independent state. It seems to have

become independent about 100 B.C., and on the death of its fifth king, Antiochus III., in 17 A.D., it was made a Roman province. It was again for a time allowed by the Romans to hold a position of nominal independence, but was reduced to a Roman province by Vespasian, 73 A.D.

Commander-in-Chief, the supreme commander of the united forces of any country. In the United States the President for the time being is commander-in-chief of the army and navy, and of the militia of the several States when the latter is in the national service and forms part of the national provisional army. In all other cases the governor of each State is the commander-in-chief of the State troops. In England he is officially called the officer commanding-in-chief. He is the head of a department of the military administration. He acts, under the secretary of state for war, as the head of the army, and when military operations are undertaken on a sufficiently large scale to require his presence, is charged with the duty of commanding the army in the field, though, as a matter of fact, this very rarely occurs.

Commander Islands, two islands belonging to Russia lying east of Kamchatka in Bering Sea. The larger, Bering Island (q.v.), lies nearest the coast; the other island of the group, Miedni, is nearly 30 miles long but narrow; it is sometimes called Copper Island, because copper is found there in small quantities. The climate is mild and there are a few inhabitants.

Commander of the Faithful, a title assumed by the Caliph Omar, and retained by his successors. See CALIPH.

Comman'dery. (1) Among the Knights Templar, Hospitallers, etc., a district under the administration and control of a member of the order, called the commander or preceptor, who received the income of the estates within that district, expending part for his own use, and accounting for the rest. In England more especially applied to a manor belonging to the Knights Hospitallers or Knights of St. John of Jerusalem. These establishments formed at the same time branches. . . . On the first creation of these (branch) establishments, they were denominated Preceptories; the superior being called the preceptor; but eventually the name became changed to that of commandery, by which they were always afterward known. The council reserved to themselves the power of at any time recalling a commander from his post, and substituting another in his place, at their pleasure; he being merely considered as the steward of their property. Time, however, gradually wrought a great change in the relative position which the commanders held to the council; and, eventually, a nomination to a commandery came to be considered in the light of a legal acquisition, subject only to the payment of a certain amount of annual tribute to the public treasury, which tribute received the name of Responsions. (2) A regular assembly of Knights Templar, which confers certain degrees. Consult 'History of Knights of Malta.'

Commandite, *kōm-mōn-det'*, a term used in France, primarily for a partnership or firm, in which one advances the funds, while another devotes his skill and assiduity; but by extension, a co-partnership *en commandite* oftener means a

COMMELIN — COMMENSALISM

company for manufacturing or trading, "with limited liability." In terms of French commercial law, those whom we would call the sleeping partners or silent partners in such associations are denominated *commanditaires*. Their names do not appear in the nominal title of the firm; they may assist it with their counsel, but they cannot order or sign for its behoof, nor act overtly for it in any way; on the other hand, they are not bound to incur a final loss in case of its failure, beyond that of the entire sum they have advanced, should indeed such be needed to satisfy the claims of agents and creditors. For all details on the rights and obligations of *commanditaires*, see the French 'Code de Commerce,' articles 23-28.

Commelin, kōm-lān, **Casper**, Dutch botanist; d. 1731. He was a nephew of Jan Commelin (q.v.).

Commelin, **Hieronimus**, hī-ē-rōn'ī-mūs. See COMMELIN, JEROME.

Commelin, **Isaac**, Dutch historian: b. Amsterdam 1598; d. there 1676. Among his works the history and description of Amsterdam is still much valued.

Commelin, **Jan**, yān, Dutch botanist: b. Amsterdam 1629; d. 1692. He was for many years a professor of botany in the university of his native city, where with his nephew, Casper, he founded the botanical gardens renowned throughout Europe.

Commelin, **Jerome**, Flemish printer: b. Douay; d. Heidelberg 1598. He was distinguished by his excellent editions of Greek and Latin classics. His emblem is a figure of Truth, and on many editions the words *Ex Officina Sanct. Andreana*.

Commelin, kōm'mě-lin, or day-flower, is a genus of the spiderwort family (*Commelinaceæ*). It contains about 95 species widely distributed in warm and temperate zones. There are about eight species found in the United States, along streams and in waste places, from New Jersey to Missouri, southward to Florida and Texas. It is also common in Asia and Africa. The fleshy rhizomes of the plant may be eaten when cooked, as they contain much starch and mucilage. In Asiatic countries some species are used for medicinal purposes. The plant receives its name from Jan and Casper Commelin, two noted Dutch botanists.

Commencement. In the colleges of the United States this term denotes the day when the students are made bachelors of arts, and the degree of master of arts and the degrees of doctors in the professions are also conferred at the same time. The term is given also to the closing exercises of secondary and even elementary schools.

Commendam, kōm-měn'dām (Lat. *commendare*, that is, to intrust), used in ecclesiastic law to denote the administrative or provisional management of a benefice during a vacancy. The person intrusted with the management is called *commendator*. The grant or benefice was sometimes converted into a regular fief and was then said to be in *perpetuam commendam*. The practice gave rise to great abuses, and is now almost unknown.

Commensal, kōm-měn'sal (Lat. *con*, together, and *mensa*, a table), literally, a messmate. This term is applied in zoology to animals which live on or in other animals for part or the whole of their life, simply sharing the food of their host without being parasitic on him: thus the pea-crabs live within the cavity of shell-fish, and find their food in the water introduced for the benefit of their host. There are various forms or degrees of commensalism. Sometimes the relation is more or less accidental, and of little, if any, use to either organism, or again it may be advantageous in a greater or less degree to one of the animals only, or yet again both host and guest may be benefited. In still higher cases the guest is, as it were, not only welcomed, but invited and induced to cling to a host. See SYMBIOSIS.

Commen'salism, the intimate connection or partnership between animals of quite different affinities; thus commensals, messmates, or fellow-boarders take up their abode together for their mutual benefit. A good example is a large sponge, whose canals and passages shelter innumerable worms, crustacea, etc., which lodge there without expense to their host. Floating jellyfish shelter certain pelagic crustaceans (*Hyperina*) and little fishes. The oyster-crab (*Pinnotheres*) is a typical case of commensalism; it does no harm to the oyster or mussel in whose shell it lives, and which protects it from danger; while, as the result of its sheltered life, its shell is soft and thin. The pearl-oyster, besides taking in a *Pinnotheres* as a boarder, admits a kind of shrimp. Certain small slender, eel-like fishes (*Fierasfer*) insinuate themselves into the body of holothurians, which also keeps open house for *Pinnotheres* and shrimps; hence a holothurian has been compared to a hotel with its *table d'hôte*. Other crustaceans board in different animals; thus a little crab (*Fabia chilensis*) lodges in the end of the intestine of a sea-urchin; another (*Porcellana*) lives on the Brazilian coast in a starfish. Polyps and corals shelter various species of crabs, snails, etc., all being of the same color, while a crinoid (*Comatula*) takes in as a permanent lodger a decapod crustacean (*Galathea*). Hermit crabs, taking up their abode in an empty snail-shell, are obliged to admit a variety of intruders who come to stay. Certain mollusks live in starfishes and other echinoderms and, as the result of their semi-parasitic life, become more or less modified and degenerate. Thus *Stylina* lives on a crinoid (*Comatula*); a species of *Stilifer* becomes encysted on the rays of a starfish (*Linckia*), and on the underside of the arms of the same *Linckia* lives a limpet-like snail (*Thyca*), while *S. astericola* lives in the body of a Bornean starfish, and so on with a number of similar cases. Ascidians throw their "front hall" (*atrium*) wide open to a variety of forms, such as small worms, polyps, mollusks, crustaceans of different orders, sea-spiders, brittle-stars. The "Venus flower-basket," a silicious sponge of the Philippine Islands, gives shelter to three different kinds of crustaceans: a prawn, a *Pinnotheres*, and an isopod.

Rising to the higher animals there occurs on an island off the New Zealand coast the case of the interesting lizard "tuatara," which shares its deep burrows with a petrel, though the latter

COMMENSURABLE — COMMERCE

may at times be the work of the bird. Each builds its nest on opposite sides of the chamber, the lizard almost invariably choosing the right, and the petrel the left side. The former sits with its head close to the entrance ready for any attack; it feeds partly on worms and beetles, and in part on the remains of fishes and crustaceans brought to their common table by the petrel.

By far the most numerous assemblage of messmates are the different kinds of beetles and other insects which live in ants' nests, the number of kinds of which amount to upward of 1,500. See ANT; COCKROACH; SYMBIOSIS.

Commen'surable, among geometricians, an appellation given to such quantities or magnitudes as can be measured by one and the same common measure. Commensurable numbers, whether integers or fractions, are such as can be measured or divided by some other number without any remainder; such are 12 and 18, as being measured by six or three.

Com'mentary, a term used (1) in the same sense as memoirs, for a narrative of particular transactions or events, as the 'Commentaries' of Cæsar. (2) A series or collection of comments or annotations. These may either be in the form of detached notes, or may be embodied in a series of remarks written and printed in a connected form.

Commentry, *kō-mān-trē*, France, a town in the department of Allier, eight miles south-east of Montluçon, in the midst of a vast coal field, to which the town owes its prosperity. There are important iron works in the vicinity. Pop. 9,200.

Commerce, a term which in its primary significance relates to an interchange of goods, merchandise or property of any kind. In its usual acceptance it relates to interchange of merchandise between countries or different parts of a country, distinguished respectively as "foreign commerce" and "internal commerce"; the commerce between the United States and other countries, for example, being of the class designated foreign commerce, that between the Atlantic seaboard and the Mississippi valley or the Pacific coast, internal commerce.

The earliest form of interchange was naturally that of man with his neighbor, the exchange of the products of the chase for those of the soil or of natural products for those ready for use; and when this was a mere exchange of article for article, and passed from hand to hand, it is more properly designated by the word "barter." But with the utilization of a common measure of value by which goods were purchased, usually to be sold again, the transactions are called commerce, especially when they occur between citizens of different localities. Among the early examples of commerce is that of the Phœnicians with the people and cities scattered along the coast of the Mediterranean, the caravans carrying the silks and spices of the far East to the Mediterranean countries, and later the markets and great fairs of the Middle Ages. With the introduction of a common and generally accepted measure of value, money, arose the class of middlemen, or merchants, who purchased the goods offered for sale and resold them. Following this came the establishment of trade centres, and when states or countries were formed and duties collected on goods entering or

leaving them, a record of the international commerce began to be established. In England there is a record of commerce as early as the year 1355, in which the imports are reported at 120,000 pounds sterling and the exports at 294,000 pounds sterling; in 1573, imports, 2,100,000 pounds sterling, and the exports, 1,180,000 pounds sterling; in 1701, imports, 5,900,000 pounds sterling, and exports, 6,900,000 pounds sterling. In France official returns date continuously from 1716, the annual average of imports for that year to 1720, being 65,000,000 francs, exports, 1,050,000,000 francs. Mulhall presents figures of the commerce of 12 European countries in 1720, making the total recorded commerce of Europe for that date 62,000,000 pounds sterling; that of Spanish-America, 10,000,000 pounds sterling; India, 9,000,000 pounds sterling; British colonies, 2,000,000 pounds sterling; and "various," 5,000,000 pounds sterling, thus making the total recorded commerce of the world at that date 88,000,000 pounds sterling, or \$428,252,000 of imports and exports combined. Accepting his figures as probably the best approximation possible for the earlier dates when official records of commerce of many of the countries were not available, the international commerce of the world from 1720 to 1900, including both imports and exports, may be stated as follows:

Year	Total Commerce	Year	Total Commerce
1720.....	\$ 428,000,000	1850.....	\$ 4,049,000,000
1750.....	681,000,000	1860.....	7,246,000,000
1780.....	905,000,000	1870.....	10,662,000,000
1800.....	1,470,000,000	1880.....	14,760,000,000
1820.....	1,660,000,000	1890.....	17,519,000,000
1830.....	1,980,000,000	1900.....	20,715,000,000
1840.....	2,788,000,000		

It will be seen from the above figures that by far the most rapid growth has occurred in the last half of the 19th century, the increase in the 80 years from 1720 to 1800 being, in round terms, but one billion dollars, and that of the 50 years from 1800 to 1850 but two and a half billions, while that of the 50 years from 1850 to 1900 was 16 billions. Meantime values of merchandise of all kinds have greatly decreased, so that the increase in the volume of merchandise exchanged is really much greater than that indicated by the mere figures of value. This increase is chiefly due to the facilities for transportation and communication which were developed in the later period. At the beginning of the 19th century there were no railroads to carry the products of the interior to the seaboard, no steam vessels to carry them from continent to continent, and no telegraphs for intercommunication. In 1850 there were but 24,000 miles of railway in the world, and this consisted of fragmentary lines not furnishing continuous communication for considerable distances; the steam vessels of the world had a tonnage of less than 1,000,000 tons; the land telegraph lines were but 5,000 miles in length, and the submarine cables of the world, 25 miles. In 1903 the railroads of the world are 500,000 miles in length, and have been brought into such relation that they furnish great through transportation systems from the interior of continents to the water's edge; the steam vessels of the world have a tonnage of 17,000,000 tons; the land telegraphs are 1,200,000 miles in length, and the submarine cables 200,000 miles. With this enormous increase in steam-carrying power on land and sea have come great reduction in charges

COMMERCE

for transportation, a great increase in the currency of the world, and such improvements in its financial systems as to greatly facilitate international commerce.

FOREIGN COMMERCE OF THE PRINCIPAL COUNTRIES
OF THE WORLD, 1900.

Year	Countries	Imports	Exports	Excess of exports (+) or im- ports (-) (000 omit- ted)
		(000 omitted)	(000 omitted)	
		Dollars	Dollars	Dollars
1901	Argentina	109,971	161,846	+ 51,875
1900	Australia	a201,125	a223,477	+ 22,352
1901	Austria-Hungary	325,486	382,748	+ 57,262
1901	Belgium	428,651	352,839	- 75,802
1901	Bolivia	7,561	16,760	+ 9,199
1901	Bulgaria	13,519	15,975	+ 2,456
1901	Brazil	96,175	197,687	+ 101,512
1900	British colonies, n. e. s. e.	dd400,595	dd283,732	- 116,863
1901-2	Canada	196,480	172,611	- 23,869
1901	Chile	50,845	62,723	+ 11,878
1901	China	190,763	120,626	- 70,137
1898	Colombia	10,695	18,487	+ 7,792
1901	Costa Rica.....	4,411	5,793	+ 1,382
1901	Cuba	66,584	63,278	- 3,306
1901	Denmark	106,371	78,290	- 28,081
1900	Ecuador	6,541	7,509	+ 968
1901	Egypt	75,356	77,754	+ 2,398
1901	France	843,254	774,498	- 68,756
1901	German Empire	1,290,254	1,054,685	- 235,569
1901	Greece	26,782	18,100	- 8,682
1900	Guatemala	3,127	1,212	- 1,915
1900-1	Honduras	2,047	3,036	+ 989
1901-2	India, British ..	264,319	403,805	+ 139,486
1900	India, French ..	36,576	30,513	- 6,063
1901	India, Dutch ...	86,895	98,723	+ 11,828
1901	Italy	331,592	264,429	- 67,163
1901	Japan	127,397	125,670	- 1,727
1900-1	Mexico	f65,084	f77,307	+ 12,223
1901	Netherlands....	818,377	695,762	- 122,615
1901	New Zealand ...	55,267	53,779	- 1,488
1900-1	Nicaragua	3,445	3,888	+ 443
1901	Norway	76,981	41,456	- 35,525
1900	Paraguay	1,839	2,064	+ 225
1900	Peru	11,276	21,890	+ 10,614
1901	Philippine Isds..	30,162	24,503	- 5,659
1901	Portugal	62,449	30,545	- 31,904
1901	Rumania.....	56,440	68,289	+ 11,849
1901	Russia	s269,493	s375,726	+ 106,233
1901	Servia	8,460	12,677	+ 4,217
1901	Siam	13,626	21,211	+ 7,585
1901	Spain	dd182,076	dd152,575	- 29,501
1901	Sweden	dd123,195	dd94,736	- 28,459
1901	Switzerland	194,142	159,984	- 34,158
1899	Turkey	117,134	59,072	- 58,062
1901	United Kingdom	2,540,264	1,362,727	-1,177,537
1901-2	United States ^g	q903,321	q1,355,482	+ 452,161
1901	Uruguay.....	24,498	28,674	+ 4,176
1898	Venezuela	dd8,560	dd14,900	+ 6,340
Total		10,869,458	9,674,063	-1,195,395

^a Exclusive of commerce between the Australasian colonies, but inclusive of precious metals.

^{dd} Including bullion and specie.

^e Except Australasia, Canada, and British India.

^f Includes imports and exports of precious metals, namely, \$2,618,000 and \$44,271,000, respectively.

^h Includes dependencies.

^g Figures for 30 June 1902.

^s Trade over the European frontier only.

With this increase of facilities for transporting the products of the interior to the seaboard and from continent to continent came a great increase in production and a reduction in cost of both production and transportation, and this reduction in cost to the consumer was followed by a great increase in the quantity and variety of the articles utilized by man, for food, clothing, and in household and business affairs. The per capita of the world's international commerce is

now about six times as great in value as a century ago, having been about \$2.35 per capita in 1800 and \$13.25 per capita in 1900, while the reduction in prices meantime indicates that the quantity represented by the per capita figures of 1900 is probably 20 times as great as that represented by those of 1800.

The commerce of the world at the latest available date, including all countries for which statistics are available, is given by the bureau of statistics of the treasury department in the table which follows, the figures being in most cases for the year 1901. It will be noted that, although the exports of one country always become the imports of some other country, the figures of total imports exceed those of total exports. This is accounted for in part by the fact that the cost of transportation is added in many cases to the stated value of the merchandise when it becomes an importation, while the fact that revenues are more generally collected on imports than on exports probably results in a more nearly complete record of the imports than of the exports.

United States Commerce.—The official record of the foreign commerce of the United States begins with the year 1790. During the existence of the Colonies the most of their commerce was with Great Britain, and during the period of confederation each State regulated its own commerce. It was not until the beginning of the present form of government that satisfactory statements of the foreign commerce of the United States became available. A record of the exports of the Colonies to Great Britain from 1697 to 1790, compiled by Mr. Charles H. Evans, shows a total of 279,852 pounds sterling, or \$1,362,000 of exports from all the Colonies to Great Britain in 1697; 415,650 pounds sterling, or \$2,023,000; in 1725, 814,766 pounds sterling, or \$3,965,000 in 1750; 1,105,170 pounds sterling, or \$5,403,000 in 1763; 1,373,846 pounds sterling, or \$6,685,000 in 1774. In 1790, the first record under the Constitution, the total imports of the United States were \$23,000,000, and the exports \$20,205,156. The period of wars in Europe which began during that decade increased the figures of the commerce of the United States greatly, by reason of the fact that merchandise from the British, French, and Dutch colonies, although subject to seizure under the blockades if passing from the colony to the mother country, was not subject to seizure if first brought to the United States by American vessels, entered as an import and then sent forward to its destination as an export from the United States. Goods from those countries destined for their colonies sometimes also evaded the blockades by a similar process. As a result, the figures of both imports and exports of the United States from 1769 to 1807 showed during that period exports of foreign merchandise actually in excess of exports of domestic merchandise, while exports of foreign merchandise are now less than 2 per cent of the total exports. The domestic exports, which were \$18,500,000 in 1791, never reached as much as \$50,000,000 until 1819, and did not reach \$100,000,000 until 1835. In 1854 they for the first time exceeded \$200,000,000, and in 1860 for the first time passed \$300,000,000. In 1871 they for the first time exceeded \$400,000,000, but from that time rapidly increased, being over \$800,000,000 in 1881, more than \$1,000,000,000 in 1892, and since 1897 have never been below the \$1,000,-

COMMERCE

000,000 limit, the highest figure reached being in 1901, \$1,460,462,806.

This rapid increase in exportations, beginning with 1870, was coincident with the opening up of the interior by railroads, and the development of the manufacturing industry. In 1870 there were 52,992 miles of railway in the country; the number of farms was 2,659,985, and the gold value of their products, \$1,958,030,927, while the value of the manufactures of the country was \$4,232,325,442, and the exports of manufactures but \$68,279,764. In 1880 the number of miles of railway was 93,262, having nearly doubled in 10 years; the number of farms, 4,008,907, and the value of their products, \$2,212,540,927; while the value of the manufactures was \$5,369,579,191. In 1890 the number of miles of railroad was 166,654, the number of farms 4,564,641, the value of farm products \$2,460,107,454, and the value of the manufactures \$9,373,437,283. In 1900 the number of miles of railroad was 194,321, the number of farms 5,739,657, and the value of their products \$3,764,177,706; while the value of manufactures had reached \$13,039,279,566. During this period of 30 years in which the number of miles of railroad nearly quadrupled, the value of farm products doubled, the value of manufactures more than trebled, the exports of agricultural products grew from \$361,188,483 in 1870 to \$835,858,123 in 1900, and those of manufactures grew from \$68,279,704 to \$433,851,759, manufactures forming but 15 per cent of the total exports in 1870 and 31 per cent in 1900. The result of this rapid growth in exports is that the United States, which in 1870 stood fourth in the list of the world's exporting nations, being surpassed by the United Kingdom, Germany, and France, was in 1901 at the head of the list, the domestic exports of the United States in that year exceeding those of any other country. The imports into the United States usually exceeded the exports prior to the great increase in exports which began with 1870. In 1874 the exports began to exceed the imports, and have so continued during nearly the entire period since that date. There was during that period, however, a comparatively slow but steady growth in imports, from \$436,000,000 in 1870 to \$668,000,000 in 1880, \$789,000,000 in 1890, and \$850,000,000 in 1900, and in 1902 they for the first time exceeded \$900,000,000. This growth is largely due to the increased demand for manufacturers' materials, the imports of which in 1870 amounted to \$120,000,000 and formed 28 per cent of the total imports, and in 1902 amounted to \$418,000,000 and formed 46 per cent of the total imports. This increase in manufacturers' materials imported is chiefly in articles not produced in the United States, such as raw silk, hemp, jute, rubber, tin, etc.

The foreign commerce is chiefly with Europe but is growing rapidly with other parts of the world. In 1880 55 per cent of the imports were from Europe, and 86 per cent of the exports went to Europe. In 1902 53 per cent of the imports were from Europe, and 73 per cent of the exports went to that continent. The exports to Asia and Oceanica have increased from \$14,000,000 in 1870 to \$116,000,000 in 1902, including in this statement the shipments to the Hawaiian Islands, which are not now stated as exports, but which should be so included in a comparative statement of this character. The commerce with the Hawaiian Islands, the Philippine Islands, and

Porto Rico has grown rapidly since their annexation to the United States, the total imports from those islands having increased from \$20,252,563 in 1897, to \$39,610,551 in 1902, and the exports to them, from \$6,733,530 in 1897, to \$34,971,311 in 1902.

The tables which follow show the annual average of imports and exports in each decade from 1790 to 1900, and the total imports and exports for each fiscal year from 1790 to 1902. They are from the annual publications of the Bureau of Statistics, and are thus the official record of the foreign commerce of the United States.

COMMERCE OF 1901 AND 1902 COMPARED WITH AVERAGE OF DECENNIAL PERIODS, 1790 TO 1900.

TEN-YEAR PERIODS	Annual Average of Ten-Year Periods of		Annual Average of Excess of	
	Imports	Exports	Imports	Exports
	Dollars	Dollars	Dollars	Dollars
1790-1800	59,184,545	46,774,236	12,410,309	.....
1801-1810	92,766,351	74,531,506	18,234,845	.....
1811-1820	80,811,927	58,989,222	21,822,705	.....
1821-1830	72,948,879	69,431,024	3,517,855	.....
1831-1840	119,520,679	103,550,201	15,970,478	.....
1841-1850	118,094,779	119,554,936	.....	1,460,157
1851-1860	284,475,036	248,887,460	35,587,576	.....
1861-1870	331,867,029	254,326,410	77,540,619	.....
1871-1880	535,221,512	589,300,719	.....	54,079,207
1881-1890	692,186,522	765,135,498	.....	72,948,976
1891-1900	763,327,858	1,024,869,210	.....	261,541,352
1901.....	823,172,165	1,487,764,991	.....	664,592,826
1902.....	903,320,948	1,381,719,401	.....	478,398,453

HISTORICAL TABLE.—TOTAL VALUE OF IMPORTS AND EXPORTS OF MERCHANDISE INTO AND FROM THE UNITED STATES, 1790-1903.

FISCAL YEAR*	Imports	Exports	Excess of imports (roman) or exports (italics).
	Dollars	Dollars	Dollars
1790.....	23,000,000	20,205,156	2,794,844
1791.....	29,200,000	19,012,041	10,187,959
1792.....	31,500,000	20,753,098	10,746,902
1793.....	31,100,000	26,109,572	4,990,428
1794.....	34,600,000	33,043,725	1,556,275
1795.....	69,756,268	47,989,872	21,766,396
1796.....	81,436,164	58,574,625	22,861,539
1797.....	75,379,406	51,294,710	24,084,696
1798.....	68,551,700	61,327,411	7,224,289
1799.....	79,069,148	78,665,522	403,626
1800.....	91,252,768	70,971,780	20,280,988
1801.....	111,363,511	93,020,513	18,342,998
1802.....	76,333,333	71,957,144	4,376,189
1803.....	64,666,666	55,800,033	8,866,633
1804.....	85,000,000	77,699,074	7,300,926
1805.....	120,600,000	95,566,021	25,033,979
1806.....	129,410,000	101,536,963	27,873,037
1807.....	138,500,000	108,343,150	30,156,850
1808.....	56,990,000	22,430,960	34,559,040
1809.....	59,400,000	52,203,233	7,196,767
1810.....	85,400,000	66,757,970	18,642,053
1811.....	53,400,000	61,316,832	7,916,832
1812.....	77,030,000	38,527,236	38,502,764
1813.....	22,005,000	27,856,017	5,851,017
1814.....	12,965,000	6,927,441	6,037,559
1815.....	113,041,274	52,557,753	60,483,521
1816.....	147,103,000	81,920,052	65,182,948
1817.....	99,250,000	87,671,569	11,578,431
1818.....	121,750,000	93,281,133	28,468,867
1819.....	87,125,000	70,142,521	16,982,479
1820.....	74,450,000	69,691,669	4,758,331
1821.....	54,520,834	54,596,323	75,489
1822.....	79,871,695	61,350,101	18,521,594
1823.....	72,481,371	68,326,043	4,155,328
1824.....	72,169,172	68,972,105	3,197,067
1825.....	90,189,310	90,738,333	549,023
1826.....	78,093,511	72,890,789	5,202,722
1827.....	71,332,938	74,309,947	2,977,009
1828.....	81,020,083	64,021,210	16,998,873
1829.....	67,088,915	67,434,651	345,736
1830.....	62,720,956	71,670,735	8,949,779
1831.....	95,885,179	72,295,652	23,589,527

COMMERCE

FISCAL YEAR*	Imports	Exports	Excess of imports (roman) or exports (italics)
	Dollars	Dollars	Dollars
1832.....	95,121,762	81,520,603	13,601,159
1833.....	101,047,943	87,528,732	13,519,211
1834.....	108,609,700	102,260,215	6,349,485
1835.....	136,764,295	115,215,802	21,548,493
1836.....	176,579,154	124,338,704	52,240,450
1837.....	130,472,803	111,443,127	19,029,676
1838.....	95,970,288	104,978,570	9,008,282
1839.....	156,496,956	112,251,673	44,245,283
1840.....	98,258,706	123,668,932	25,410,226
1841.....	122,957,544	111,817,471	11,140,073
1842.....	96,075,071	99,877,995	3,802,924
1843.....	42,433,464	82,825,689	40,392,225
1844.....	102,604,606	105,745,832	3,141,226
1845.....	113,184,322	106,040,111	7,144,211
1846.....	117,914,065	109,583,248	8,330,817
1847.....	122,424,349	156,741,598	34,317,249
1848.....	148,638,644	138,190,515	10,448,129
1849.....	141,206,199	140,351,172	855,027
1850.....	173,509,526	144,375,726	29,133,800
1851.....	210,771,429	188,915,259	21,856,170
1852.....	207,440,398	166,984,231	40,456,167
1853.....	263,777,265	203,489,282	60,287,983
1854.....	297,803,794	237,043,764	60,760,030
1855.....	257,808,708	218,909,503	38,899,205
1856.....	310,432,310	281,219,423	29,212,887
1857.....	348,428,342	293,823,760	54,604,582
1858.....	263,338,654	272,011,274	8,672,620
1859.....	331,333,341	292,902,051	38,431,290
1860.....	353,616,119	333,576,057	20,040,062
1861.....	289,310,542	219,553,833	69,756,709
1862.....	189,356,677	190,670,501	1,313,824
1863.....	243,335,815	203,964,447	39,371,368
1864.....	316,447,283	158,837,988	157,609,295
1865.....	238,745,580	166,029,303	72,716,277
1866.....	434,812,066	348,859,522	85,952,544
1867.....	395,761,096	294,506,141	101,254,955
1868.....	357,436,440	281,952,899	75,483,541
1869.....	417,506,379	286,117,697	131,388,682
1870.....	435,958,408	392,771,768	43,186,640
1871.....	520,223,684	442,820,178	77,403,506
1872.....	626,595,077	444,177,586	182,417,491
1873.....	642,136,210	522,479,922	119,656,288
1874.....	567,406,342	586,283,040	18,876,698
1875.....	533,005,436	513,442,711	19,562,725
1876.....	460,741,190	540,384,671	79,643,481
1877.....	451,323,126	602,475,220	151,152,094
1878.....	437,051,532	694,865,766	257,814,234
1879.....	445,777,775	710,439,441	264,661,666
1880.....	667,954,746	835,638,658	167,683,912
1881.....	642,664,628	902,377,346	259,712,718
1882.....	724,639,574	750,542,257	25,902,683
1883.....	723,180,914	823,839,402	100,658,488
1884.....	667,697,693	740,513,609	72,815,916
1885.....	577,527,329	742,189,755	164,662,426
1886.....	635,436,136	679,524,830	44,088,694
1887.....	692,319,768	716,183,211	23,863,443
1888.....	723,957,114	695,954,507	28,002,607
1889.....	745,131,652	742,401,375	2,730,277
1890.....	789,310,409	857,828,684	68,518,275
1891.....	844,916,196	884,480,810	39,564,614
1892.....	827,402,462	1,030,278,148	202,875,686
1893.....	866,400,922	847,665,194	18,735,728
1894.....	654,994,622	892,140,572	237,145,950
1895.....	731,969,965	807,538,165	75,568,200
1896.....	779,724,674	882,606,938	102,882,264
1897.....	764,730,412	1,050,993,556	286,263,144
1898.....	616,049,654	1,231,482,330	615,432,676
1899.....	697,148,489	1,227,023,302	529,874,813
1900.....	849,941,184	1,394,483,082	544,541,898
1901.....	823,172,165	1,487,764,991	664,592,826
1902.....	903,320,948	1,381,719,401	478,398,453
1903.....	1,001,596,683	1,414,786,954	413,190,271
Total....	34,255,140,956	37,859,980,715	3,602,839,759

NOTE.— Figures include specie prior to 1821.

*Fiscal year ended 30 September prior to 1843; since that date 30 June.

In 1903 a Department of Commerce and Labor was created by the Congress of the United States, its chief officer to be a member of the cabinet, the province and duty of the department being to "foster and develop the foreign and domestic commerce, the mining, manufacturing, shipping, and fishery industries, the labor interests, and the transportation facilities of the United States." The Bureau of Statistics, Bureau of Navigation, Steamboat Inspection Ser-

vice, Light House Establishment, Coast and Geodetic Survey, Bureau of Standards, Bureau of Immigration, Department of Labor, Census Office, and Fish Commission were transferred from other departments to the Department of Commerce and Labor; also the Bureau of Foreign Commerce of the State Department, which was consolidated with the Bureau of Statistics; and two new bureaus, Bureau of Corporations and a Bureau of Manufactures, created as a part of the department. Hon. George B. Cortelyou, former secretary to the President, was nominated by the President and confirmed by the Senate as the secretary of Commerce and Labor. The other governments which have similar governmental organizations devoting their attention to commerce are Germany, France, Belgium, Austria-Hungary, Spain, Portugal, Italy, and the United Kingdom; the organization of the latter being designated the Board of Trade, its president, however, being a member of the cabinet.

OSCAR P. AUSTIN,

Treasury Dep't, Washington, D. C.

Commerce, a card game in which each player contributes an equal sum to the pool, and a full pack of cards is dealt to the players. The eldest hand, that is, the one who received the first card on the left of the dealer, then exchanges one of his cards with his left hand player, who, in turn, exchanges one with his left hand player, and so on, until some one finds that his hand consists entirely of cards of one suit, when he calls out "My Ship Sails." Aces count 11, court cards 10, the rest according to "pips." Each player, through all the exchanges, is aiming to hold a tricon, three cards alike; a sequence, three following each other in the same suit; or a point, the smallest number of pips on three cards. The winner of the pool is the player who has the highest tricon, or, if none is displayed, the highest sequence, or in its place the holder of the best point. See Cassell, 'Book of Pastimes.'

Commerce, Chambers of. See CHAMBERS OF COMMERCE.

Commerce, Interstate. The colonies, under the lead of Massachusetts, early attempted to provide roads; yet for more than two hundred years nothing existed in this country that by any stretch of the imagination could be called a postal service. The only carriers of commerce for nearly two hundred years after the first settlers sought these shores were the simple sailing vessels, that crossed the ocean only at the greatest hazard. Courageous attempts to navigate the ocean waters and the almost unknown rivers and lakes were numerous before 1800, and canals, even, were attempted. It can hardly be said, however, that anything deserving the name of interstate commerce existed in this country at the beginning of the 19th century, since at that time the total effects of the government were transported from Philadelphia to Washington in a frail sloop, and President John Adams and his wife lost their way, as tradition has it, in the woods beyond Baltimore, as they proceeded in their carriage toward the new capital. The Alleghanies constituted an almost impassable barrier between the East and the West, and such necessary products as the colonists could not obtain in their immediate neighborhoods were mostly brought from over seas.

COMMERCE

There was another difficulty in the way of trade. The high price of labor rendered it impossible to manufacture linen, cotton, or woolen cloth, except at a cost 20 to 50 per cent greater than the same stuffs could be turned out for in England. The trade of New Hampshire was principally in lumber and fish, which were exported. In Massachusetts a little wool and flax were worked into a coarse cloth, and a few hats were made, but it was cheaper to import them. In the province of New York the export of furs, whalebone, oil, pitch, tar, and provisions included everything. So it was in New Jersey. Virginia produced nothing for intercolonial trade. Tobacco was a permanent staple, but it became chiefly an export. The early colonists were inevitably sailors. Therefore a considerable coasting trade grew up, but there were no means of internal transportation except by wagons and the rude craft plying the natural waterways. In spite of this the Constitution, which went into operation 4 March 1789, embraced the right to regulate domestic commerce,—a right not conferred by the previous Articles of Confederation,—and from that year one may find exhibits of the tonnage employed in the coastwise trade. In 1789 this tonnage was 78,607; in 1812 it was 477,971.

The Americans of those early times had only a vague knowledge of the country west of the Allegheny mountains; yet the hardy settlers along the coast soon beat out for themselves paths to this unknown region. The act to provide for the Cumberland road was passed March 29, 1806, and the first stage-coach driven from Cumberland to Wheeling in 1818. The length of the line first opened was 130 miles, and its cost \$1,700,000. In those years, too, were tried the first experiments with steam-craft. Livingston and Fulton built the Clermont in 1807, and Fulton claimed under his patent a monopoly of transportation on the Hudson and other rivers. His claim was carried to the courts and defeated, so that after 1815 the rivers of the country were free to steam-vessels. In 1812 steamboats made their appearance on the western rivers. The first craft, the New Orleans, built at Pittsburg by Fulton at a cost of \$40,000, a stern-wheeler of between 300 and 400 tons, put out for New Orleans. Others followed, but none proved able to ascend the river, until 1815, when the Enterprise, a stern-wheeler of 70 tons, made the trip from New Orleans to Cincinnati in 28 days. It was later than this, again, that steamships came gradually to ply up and down the coast.

The first charter for canal building was granted to the James River Company by the legislature of Virginia in 1785. Another of these projects was the Dismal Swamp Canal, begun in 1787, under a joint charter from Virginia and North Carolina, and opened in 1794. The owners of its stock included George Washington and Patrick Henry, and it was originally designed to facilitate the movement of lumber out of the Dismal Swamp. The Chesapeake and Ohio Canal, the Delaware and Chesapeake Canal, and the Union Canal, of Pennsylvania, intended to connect the Delaware and Susquehanna rivers, were only forerunners of the Erie Canal, 363 miles long, completed in 1825. A canal from Lake Champlain to the Hudson River was completed in 1823. On the opening of the Erie Canal the cost of freight fell, according to its class, all the way in amount

from \$15 to \$25 per ton, and the time of transit from 20 to eight days. Wheat was worth \$33 per ton in western New York, and it did not pay to send it to market, down the Susquehanna to Baltimore. The canal changed all that. Indeed, it has been said that the Erie Canal added \$100,000,000 in value to the farms of New York State. It made New York city the commercial metropolis. Freight which had gone overland from Ohio to Pittsburg and Philadelphia, at a cost of \$120 per ton, now went to New York by way of the lakes, the great canal, and the Hudson. The opening of the Erie Canal excited also a fever of enterprise in canal building in Ohio, Pennsylvania, Massachusetts, Maryland, and Virginia.

The first voyagers on the Great Lakes, La Salle and Hennepin, set sail in 1678 in a schooner of 10 tons, which they had launched near the present city of Kingston, Ontario. From the mouth of the Niagara River they continued their journey by land, and in the following May launched the Griffin, the first sailing vessel to navigate the upper lakes. In September they reached their destination at Green Bay. From 1700 until 1756 the construction and navigation of sailing vessels on the lakes was largely confined to Lake Ontario. Then the English began to build and sail vessels upon Lake Erie and Lake Ontario, and the commerce of Lake Ontario increased so fast, that in 1800 it exceeded that of all the other lakes together. The first American vessel to sail Lake Erie was launched at Erie in 1798. The first steam-vessel that navigated the lakes was built at Sackett's Harbor in 1817, and measured 240 tons. The next year the first steamboat above Niagara Falls was launched at Black Rock, and made voyages between that place and Detroit. The schooner Illinois, 100 tons, was the first vessel to arrive at Chicago from the lower lakes. "This event," writes one, "occurred 12 July 1834, when all the male inhabitants of the village, amounting to nearly 100, assisted in dragging the craft across the bar."

Gibson and Linn, according to Ringwalt, in 1776, descended the Ohio and the Mississippi from Pittsburg to New Orleans, and brought back a cargo of 136 kegs of gunpowder for the use of the continental army. When they reached the falls of the Ohio River they were obliged to unload their boats and carry the cargo around the falls; but the success of their trip gave an impetus to the flatboat trade which has continued in one form or another up to the present time. The first regular packet line between Pittsburg and Cincinnati was established in 1794, and consisted of four keel-boats of 20 tons each. They were much like the modern canal-boats, and could be either propelled by sails, pushed by poles, or towed by horses. Freight charges were high, the following rates for steamboats on the Mississippi having been established by the legislature of Louisiana in 1812: From New Orleans to Louisville, four and one-half cents per pound for heavy goods, and six cents for light, averaging five cents per pound, or per ton \$112; from New Orleans to Natchez, three quarters of a cent per pound, or \$1.50 per barrel; and the same rate for all intermediate landings from New Orleans to Louisville. Passage, \$125 for the full trip, and \$30 to Natchez. Half-rates were allowed for tonnage going down the river.

COMMERCE

Hon. Levi Woodbury, who made a trip down the Mississippi in 1833, says: "At every village we find from 10 to 20 flat-bottom boats, which, besides corn on the ear, pork, bacon, flour, whiskey, cattle and fowls, have a great assortment of notions from Cincinnati and elsewhere. Among these are corn brooms, cabinet furniture, cider, apples, plows, cordage, etc. They remain in one place until all is sold out, if the demand be brisk; if not, they move further down. After all is sold out they dispose of their boat, and return with their crews by the steamers to their homes."

By 1856, however, the steam-tonnage of the Mississippi and its tributaries equaled the steam-tonnage of the whole of Great Britain. Until 1850 the boats measured from 200 to 400 tons; but the builders enlarged their vessels from year to year, until, in 1878, they attained the size of the transatlantic liners. The steam-tonnage of the inland and coast lines of the United States increased from 24,879 tons in 1823 to 1,172,372 tons in 1876, as follows:

INLAND AND COASTWISE FLEETS, 1876.

	Number of Vessels	Tonnage
Atlantic and Gulf coasts	2,081	665,879
Pacific coast.....	270	78,439
Northern lakes	921	201,742
Western rivers.....	1,048	226,312
Total	4,320	1,172,372

In 1891 there were on the Great Lakes 3,700 steam- and sail-vessels, with a net registered tonnage of 1,250,000 tons. In that year they carried 63,250,000 tons of freight, while in 1890 the ton-mileage carried by this fleet was 18,849,348 ton-miles, or 24.7 per cent of the ton-mileage of all the railroads of the United States. The tonnage of the lake marine more than doubled during the five years from 1887 to 1892. On the 16,000 miles of the navigable waters of the Mississippi River and its tributaries there were afloat, in 1890, 7,445 crafts of all kinds, with a registered tonnage of 3,400,000 tons. During the year this fleet carried 30,000,000 tons of freight and 11,000,000 passengers. The Hudson River had, in the same year, a traffic of 5,000,000 passengers and 15,000,000 tons of freight, exclusive of 3,500,000 tons that passed through the canals of New York by way of the Hudson River to tide-water. The total for these four divisions of waterways alone was 111,750,000 tons. The Mississippi Valley rivers furnish transportation facilities for 24 States, embracing an area of 1,240,000 square miles. In 1903 about 23,255 vessels of 5,198,569 tons were engaged in our domestic trade.

The average freight rate on wheat from Chicago to New York in 1902 was 5.3 cents per bushel by lake and canal, and 17½ cents per bushel by rail, the water cost being \$1.76 per ton, and the rail cost \$5.82 per ton. The Erie Canal is only a little over 300 miles long, yet Mr. Albert Fink says that it regulates the freight rates of all the railroads east of the Mississippi River, not only on those whose tracks run parallel with the canal, but upon those in every part of that territory.

The development of the railway system of the United States has been without a parallel. Time and distance have been overcome, and the products of the farmers, the lumbermen, the miners, and the artisans now reach in successful com-

petition the markets of the world. The railway had its inception less than 70 years ago in the little four-mile tramway constructed to the granite quarries in the town of Quincy, Mass., and operated by horses. The first really important railway was the Baltimore and Ohio, 14 miles of which were opened in 1830. In the same year the South Carolina Railway was begun; in 1833 it was completed for 136 miles, and was then the longest railway in the world. It was also the first railway to carry the United States mails. In 1834 the opening of the Philadelphia and Columbia Railroad, as part of the system of internal improvements of Pennsylvania, gave that State a continuous line of railways and canals from Philadelphia to Pittsburg. In 1835 the Washington branch of the Baltimore and Ohio road was opened. The completion of the Boston and Albany road in 1841, and a connecting-link composing the line from Albany to Buffalo in 1842, marked the opening of the first great railway line. The real beginning of interstate commerce in this country may be said to date from this time.

The total railway mileage of the United States in 1902 was above 200,000 miles, or nearly one half the railway mileage of the world. The total mileage of all tracks reaches 274,195.36 miles, representing a capital of nearly \$13,000,000,000—an amount equal to one sixth of the entire wealth of the country, and five times greater than the entire circulating currency of the United States. The annual gross earnings and other income of this capital is more than \$1,900,000,000—an amount more than three times the entire annual revenues of the government; and it operates lines having an annual traffic of nearly 650,000,000 passengers and more than 1,200,000,000 tons of freight. An idea of the magnitude of this single branch, concerned with the transportation of freight, may be conveyed when it is stated that 1,000,000,000 tons means that a train of cars long enough to reach more than six times around the earth would be required to transport it all at a single load. The average distance over which this freight was hauled by the railroads was about 128 miles. Set a single team to the task, and it would take it something like 1,400,000 years to move the same amount 25 miles.

The total number of tons of freight carried by the steamers and sailing vessels of the rivers, lakes, and coastwise transportation routes of the United States in 1902 may be reckoned one third that of the railways. Add to this amount the freight traffic of the railways during the year 1902, namely, 1,200,315,787 tons; this would make the total average tonnage of the railways and waterways of the country more than a billion and a half tons, or 20 tons for every inhabitant of our continental possessions.

As late as 1850 there seems to have been little conception of the influence which the railways were to wield in the development of the interstate traffic of this great country, and of the country itself. It was thought that they could not successfully compete with waterways and canals, except where a speedy carriage was essential. The solution of the problem of cheap transportation from Pittsburg, for example, was not reached until the railroads threatened to take away all traffic from the traders; so that Pittsburg coal can now be delivered in New Orleans for about \$2.60 per ton, although New

COMMERCE

Orleans is 2,000 miles away by river. Cow Island, on the upper Missouri, is 4,300 miles from Pittsburg; yet coal is carried to market there, a distance as great as from New York to the Baltic Sea. Not less than 20,000 miles of inland navigable waters are accessible to these Pennsylvania coal traders. The aggregate number of vessels engaged in this business is more than 4,000, and of the 13,000,000 tons of coal that were mined in 1893 in the counties near Pittsburg about 4,500,000 tons were carried to market by water. Yet let me illustrate further the growth of domestic trade in a part of our country which was only lately as remote and undeveloped as the westernmost provinces of Brazil. This growth, due to the transition from the pony express to the transcontinental steam-car, quickened the activities of California and of the whole Pacific slope like the inspiration of a new life. The assessed value of all property within California rose from \$260,563,886 in 1869 to \$584,578,036 in 1879. In 1889 shipments were made over the lines of the Southern Pacific system of 1,140,596,010 pounds from San Francisco, and of 1,571,347,605 to San Francisco. The probable duration of an overland journey from the Missouri River to California before the continental railways were constructed was about 110 days.

Chittenden in his early steamboat navigation on the Missouri River says the traffic reached high-water mark in 1867. That profits on a single voyage of a boat between Saint Louis and Fort Benton had reached as high as \$65,000.

Freight rates were 12 cents a pound in 1866, or \$240 a ton. Insurance rates 6½ cents on sidewheel and 8 cents on sternwheel steamers; a cabin passenger paying \$300, and the salary of a pilot whatever he might be pleased to ask, as high as \$1,200 per month being paid.

It is claimed that the practically unobstructed competition which has prevailed among railways has been a main cause of many consolidations of railway interests. On the other hand, in defense of consolidation and combination, it is asserted that these result in better and swifter service and lower rates. Whatever the cause or causes, rates generally are much lower than they were 10 years ago. On 30 June 1894, 44 railways, each with an operated mileage of over 1,000 miles, out of a total of 1,039 operating corporations, controlled and operated 56.30 per cent of the total railway mileage in the United States. Extend the classification to include all roads operating over 400 miles of line, and it appears that 90 corporations operate 72.90 per cent of our total railway mileage. In 1837 the superintendent of motive power of the Columbia and Philadelphia Railroad reported that the following charges were imposed on the railroads named:

FREIGHT RATES ON RAILROADS IN 1837.

Railroad	Per Ton per Mile Cents
Baltimore & Ohio.....	4½
Baltimore & Washington.....	4
Winchester & Potomac	7
Portsmouth & Roanoke.....	8
Boston & Providence.....	10
Boston & Lowell.....	7
Mohawk & Hudson.....	8
Petersburg.....	10

These rates seem preposterous when compared with the .757 of one cent per ton per mile, which was the average charge on all the rail-

roads of the United States during the year 1902.

The growth of lake commerce in this country is something marvelous. The increase of freight shipments through the Saint Mary's Canal, both east and west bound, was from 1,560,000 tons in 1881 to 28,403,065 tons in 1901. There was an increase in the valuation of this tonnage from \$28,965,612.92, in 1881, to \$290,000,000 in 1901. During the season of 225 days in 1901 in which this canal was open there passed through it 14,372 steamers and 4,482 sail-vessels—a total, with unregistered craft, of 20,041 vessels, or an average of about 90 per day during the entire season. The total registered tonnage for the season was 8,400,680. The freight which passed through the canal in 1900 was carried an average distance of about 825 miles, at a cost per mile per ton of 1.18 mills. The size of the vessels passing through the canal continues to increase. The average registered tonnage per vessel in 1867 was 626.3 tons, while in 1891 it was 962.1 tons, and in 1901 there were over 100 vessels, steam and sail, of from 5,000 to 8,000 tons and 10 above 8,000 tons. This freight-tonnage during the season of 1889 amounted to 19,717,860 tons. The tonnage passing through the same canal during the season of 1890, including the foreign and coastwise traffic, amounted to 21,888,472 tons, while the tonnage of all vessels of the Atlantic coast engaged in foreign trade during 1890 was but little more—22,497,817 tons. All the vessel-tonnage engaged in the foreign trade, entering and clearing at London, England, during the same year was 13,480,767 tons, and at Liverpool the same year it was 10,941,800 tons; so that the vessel-tonnage passing through the Saint Mary's Canal in 1890 was more than 8,000,000 more than that of London, about double that of Liverpool, and nearly equal to that of the two combined. Another comparison: The tonnage passing through the Suez Canal in 1900 was 13,699,237—less than one half of that passing through the Saint Mary's which was open for navigation during the season of 1890 only 228 days, while the Suez Canal was open during the entire year. The total tonnage, entrances, and clearances, of the foreign and coastwise trade of Chicago and Buffalo for the season of 1901, as compared with the total foreign trade tonnage of the four great British ports, was as follows:

CHICAGO AND BUFFALO TRADE.

	Tons
Chicago.....	13,831,882
Buffalo.....	10,455,032
London.....	17,275,645
Liverpool.....	12,636,225
Glasgow.....	3,825,890
Hull.....	4,425,356

Carrying the comparison still further, the volume of this inland trade is again shown in the figures giving the foreign trade of the following great commercial ports in 1901-2:

FOREIGN TRADE TABLE.

	Tons
New York.....	12,646,555
Hamburg.....	16,441,470
Antwerp.....	14,967,921
Marseilles.....	9,563,544
Havre.....	4,406,159
Bremen.....	4,377,824
Boston.....	4,498,785
Philadelphia.....	3,871,928
San Francisco.....	2,562,655

COMMERCE

It will be seen that the commerce of the two inland cities, Chicago and Buffalo, consisting almost wholly of a coastwise trade within the confines of the Great Lakes, compares most favorably with the tonnage movement of the great maritime cities of the world. In 1867 the average rate for carrying iron ore from Escanaba to Lake Erie was \$4.25 per ton; in 1870 the average rate was \$2.50 per ton; in 1891 the average rate was 82 cents per ton; and at one time in that year it was as low as 55 cents per ton.

The benefit of these great reductions in lake transportation rates appears very forcibly in the movements of the huge cargoes of coal that are sent from ports on Lake Erie to the harbors of the upper lakes. In 1887 the average rate per ton for lake transportation of coal from Buffalo to Chicago was \$1.05; in 1891 the average rate was 50 cents per ton; and from 10 Nov. 1891 to the close of navigation, coal was carried from Buffalo to Duluth, a distance of 1,000 miles, for 10 cents per ton. Using the common unit (cost per ton per mile) for comparison, and taking the official report of the movement of freight through the St. Mary's Falls Canal, the ton-mileage rate has decreased as follows: 1887, 2.3 mills; 1888, 1.5 mills; 1889, 1.5 mills; 1890, 1.3 mills. The average revenue per ton of freight per mile on all the railroads of the United States was given at 9.4 mills in 1890, or more than seven times as much as the cost of freight carriage through the St. Mary's Falls Canal.

The regulation of interstate commerce before the Declaration of Independence was by Parliament. Under the Articles of Confederation trade was controlled, where it was controlled at all, by the legislatures of 13 distinct sovereignties. It soon became evident that the several States would not unite in any general or fixed rule to govern commerce. Discriminations naturally followed, which resulted in confusion and discord among the different parts of the confederacy. Accordingly one of the reforms demanded under the old confederacy, and introduced in the Constitutional Convention, was that "Congress shall have power . . . to regulate commerce . . . among the several States." The dissatisfaction among the States in respect to the interchange of trade, and the urgent demand for a uniform and general principle controlling their commerce, were clearly shown in the debates of the Constitutional Convention. The following contemporaneous opinions are of interest:

"The want of authority in Congress, under the confederation, to regulate commerce had produced in foreign nations, particularly Great Britain, a monopolizing policy injurious to the trade of the United States. . . . The same want of a general power over commerce led to an exercise of the power, separately, by the States, which not only proved abortive, but engendered rival, conflicting, and angry regulations." (Madison Papers, Vol. V., p. 119.)

"The oppression of the uncommercial States was guarded against by the power to regulate trade between the States." (Mr. Sherman, Deb. on Fed. Cons., Mad. Pap., Vol. V., p. 434, 1787.)

"Mr. Carroll and Mr. L. Martin expressed their apprehensions, and the probable apprehensions of their constituents, that, under the power of regulating trade, the general legislature might favor the ports of particular States, by re-

quiring vessels destined to or from other States to enter thereat." (Ibid., p. 455.)

To cover this defect, Art. I., Sec. 9, Cl. 6, of the Constitution was enacted, to wit: "No preference shall be given by any regulation of commerce or revenue to the ports of one State over those of another, nor shall vessels bound to or from one State be obliged to enter, clear, or pay duties in another."

Gen. Washington, in a letter to a friend on the weakness of the confederation, and pleading for a stronger government, wrote: "We have abundant reason to be convinced that the spirit of trade which pervades these States is not to be repressed. It behooves us, then, to establish just principles, and this cannot, any more than other matters of national concern, be done by 13 heads differently constructed and organized. The necessity, therefore, of a controlling power is obvious, and why it should be withheld is beyond my comprehension."

Alexander Hamilton, in the 'Federalist,' Letter VII., wrote: "The competition of commerce would be another fruitful source of contention. The States less favorably circumstanced would be desirous of escaping from the disadvantages of local situation, and of sharing in the advantages of their more fortunate neighbors. Each State or separate confederacy would pursue a system of commercial probity peculiar to itself. This would occasion distinctions, preferences, and exclusions which would beget discontent. The habits of intercourse on the basis of equal privileges, to which we have been accustomed from the earliest settlement of the country, would give a keener edge to those causes of discontent than they would naturally have, independent of the circumstances." Also, in Letter XXII.: "The interfering and unneighborly regulations of some States, contrary to the true spirit of the Union, have, in different instances, given just cause of umbrage and complaint to others; and it is to be feared that examples of this nature, if not restrained by a national control, would be multiplied and extended till they became not less serious sources of animosity and discord than injurious impediments to the intercourse between the different parts of the confederacy."

In the debates of the Constitutional Convention, the clause regulating commerce, etc., was agreed to *nem. con.*, not even a yea-and-nay vote being taken. When the grant of this power to regulate commerce among the States was made by the Constitution, the traffic which might be controlled under it was quite insignificant. On the land there was nothing that could approach the dignity of interstate commerce, and its regulation, as also of that which was exclusively State traffic, was for the most part left to the rules of the common law. The exceptional regulations, if any seemed to be called for, were made by the State laws. For the regulation of commerce on the ocean and other navigable waters, Congress very promptly passed the necessary laws; but its jurisdiction within the limits of the States was not very clearly understood, and it was not until the celebrated case of *Gibbons v. Ogden*, decided in 1824, that it was authoritatively and finally determined that the waters of a State, when they constituted a highway for foreign and interstate commerce, are, so far as concerns such commerce, as much

COMMERCE

within the reach of Federal legislation as are the high seas, and consequently that exclusive right for their navigation cannot be granted by States whose limits embrace them. But while providing from time to time for the regulation of commerce by water, Congress still abstained from undertaking the regulation of commerce by land. The reasons were the same. The land commerce was insignificant, and the rules of the common law were in general found adequate for the settlement of any questions. When Congress provided for the construction of the Cumberland road, it was thought undesirable to regulate its use by national law, or to take national supervision of the commerce upon it; and it was left to the supervision and care of the States through or into which the road was built. With the application of steam as a motive power for propelling vessels, conditions were immediately changed. But even then the circumstances were favorable to a prolongation of State control. The first improved highways were turnpikes, the next in grade canals; but the highways by water, as well as the highways by land, were provided for by the States. It was not unnatural that they should be left in charge of the regulation of trade upon them, especially as no complaint was made that their regulations were unjust, or that they discriminated unfairly as against the citizens or the business of other States. When, in 1830, steam-power began to be applied to the propulsion of vehicles upon land, the same conditions continued to prevail. The power of the Federal government in the regulation of commerce between the States was put forth negatively rather than affirmatively; that is to say, it was put forth in restraint of excessive State power, instead of by way of affirmative national regulation.

The subject of the management of railways in respect to interstate commerce had been more or less discussed in Congress, when in March 1885, a resolution was adopted by the United States Senate empowering a select committee, known subsequently as the Cullom Committee, to investigate it. On 18 Jan. 1886, this committee submitted a report based upon testimony contained in more than 1,450 printed pages. On page 40 the committee says: "Unjust discrimination is the chief cause of complaint against the management of railroads in the conduct of business, and gives rise to much of the pressure upon Congress for regulating legislation."

In summing up the testimony, on pages 180-2 the committee says: "The complaints against the railroad systems of the United States expressed to the committee are based upon the following charges: (1) That local rates are unreasonably high, compared with through rates; (2) that both local and through rates are unreasonably high at non-competing points, either from absence of competition or in consequence of pooling agreements that restrict its operation; (3) that rates are established without apparent regard to the actual cost of the service performed, and are based largely upon what the traffic will bear; (4) that unjustifiable discriminations are constantly made between individuals in the rates charged for like service under similar circumstances; (5) that improper discriminations are made between articles of freight and branches of business of a like character, and between different quantities of the same class of freight; (6) that unreasonable dis-

criminations are made between localities similarly situated; (7) that the effect of the prevailing policy of railroad management is, by an elaborate system of secret special rates, rebates, drawbacks, and concessions, to foster monopoly, to enrich favored shippers, and to prevent free competition in many lines of trade in which the item of transportation is an important factor; (8) that such favoritism and secrecy introduce an element of uncertainty into legitimate business that greatly retards the development of our industries and commerce; (9) that the secret cutting of rates, and the sudden fluctuations that constantly take place, are demoralizing to all business except that of a purely speculative character, and frequently occasion great injustice and heavy losses; (10) that in the absence of national and uniform legislation the railroads are able, by various devices, to avoid their responsibility as carriers, especially on shipments over more than one road, or from one State to another, and that shippers find great difficulty in recovering damages for the loss of property or for injury thereto; (11) that railroads refuse to be bound by their own contracts, and arbitrarily collect large sums in the shape of overcharges, in addition to the rates agreed upon at the time of shipment; (12) that railroads often refuse to recognize or be responsible for the acts of dishonest agents acting under their authority; (13) that the common law fails to afford a remedy for such grievances, and that in case of dispute the shipper is compelled to submit to the decision of the railroad manager or pool commissioner, or run the risk of incurring further losses by greater discriminations; (14) that the differences in the classifications in use in various parts of the country, and sometimes for shipment over the same road in different directions, are a fruitful source of misunderstandings, and are often made a means of extortion; (15) that a privileged class is created by the granting of passes, and that the cost of the passenger service is largely increased by the extent of this abuse; (16) that the capitalization and bonded indebtedness of the roads largely exceed the actual cost of their construction or their present value, and that unreasonable rates are charged in the efforts to pay dividends on watered stock and interest on bonds improperly issued; (17) that railroad corporations have improperly engaged in lines of business entirely distinct from that of transportation, and that undue advantages have been afforded to business enterprises in which railroad officials are interested; (18) that the management of the railroad business is extravagant and wasteful, and that a needless tax is imposed upon the shipping and traveling public by the unnecessary expenditure of large sums in the maintenance of a costly force of agents engaged in a reckless strife for competitive business."

The report of Senator Cullom's committee formed the basis of the law commonly known as the Interstate Commerce Act, which became effective 3 April 1887. The supreme court in the case of the Union Pacific Railway Company against Goodridge, October term, 1892, in speaking of a similar act of the State of Colorado, said: "This act was intended to apply to interstate traffic the same wholesome rules and regulations which Congress two years thereafter applied to commerce between the States, and to

COMMERCIAL COURTS

cut up by the roots the entire system of rebates and discriminations in favor of particular localities, special enterprises, or favored corporations, and to put all shippers on an absolute equality."

The statute recognizes the fact that it is no proper business for a common carrier to foster particular enterprises or to build up new industries; but, deriving its franchise from the legislature, and depending upon the will of the people for its very existence, it is bound to deal fairly with the public, to extend reasonable facilities for the transportation of persons and property, and to put all its patrons upon an absolute equality. The laws making the giving of transportation privileges a criminal offense are at present difficult of enforcement. Public opinion has not yet been roused to the energetic condemnation which is necessary to make these special favors as completely unknown as they are at the post-office window, where the value of every stamp must be paid.

At the head of all the vast machinery employed in moving interstate commerce are men of integrity, and of ability rarely developed in other walks of life, broad-gauged men, to whom the public is indebted for the efficiency with which they carry on their stupendous enterprises. Under the railway presidents are the traffic managers, the passenger and freight agents. The feeling of these men that they must serve solely the corporations which employ them has grown to be a second nature with them. Their duty to the government and to the public, therefore, is sometimes obscured, and it is hard for them to realize that many practices which they have come to regard as ordinary business methods are wrong. So also the shipper and the merchant find it hard to realize that the push and barter and dicker that have made them successful must be abandoned when they ship their merchandise; that it is no longer to be bargained for, and cannot be carried except at a rate open to every competitor.

On 4 Feb. 1887, the Act of Congress creating the Interstate Commerce Commission, and investing it with authority to regulate certain matters with respect to commerce which were detrimental to the public interest, and with authority to require annual reports from all carriers engaged in carrying interstate commerce, was passed. This act, being in the nature of experimental legislation, has not accomplished all that its framers hoped or intended, but that great good has been accomplished cannot be denied. Various defects in its practical application have from time to time been brought to the attention of Congress, and amendments to remedy some of them have been adopted. The statistics compiled from the reports required under the provisions of this act have marked a new era in railway statistics in this country. Being compiled from sworn reports made up on a uniform plan and for a uniform period, in compliance with a requirement of law, and published as official documents of the government, they are accepted as authority, and eagerly sought after by the public and by railway officers.

I may observe in closing that within the last two or three years the courts have taken advanced ground in asserting the power of the Federal government over interstate commerce. It was held by the supreme court in the case of Debs that "the government of the United States

is one having jurisdiction over every foot of soil within its territory, and acting directly upon each citizen; that while it is a government of enumerated powers, it has within the limits of those powers all the attributes of sovereignty; that to it is committed power over interstate commerce and the transmission of the mail; that the powers thus conferred upon the national government are not dormant, but have been assumed and put into practical exercise by the legal action of Congress; that in the exercise of those powers it is competent for the nation to remove all obstructions upon highways, natural or artificial, to the passage of interstate commerce or the carrying of mail; that while it may be competent for the government (through the executive branch, and in the use of the entire executive power of the nation) to forcibly remove all such obstructions, it is equally within its competency to appeal to the civil courts for an inquiry and determination as to the existence and character of any alleged obstructions, and if such are found to exist, or threaten to occur, to invoke the powers of those courts to remove or restrain such obstructions." In this case the extent and nature of the power of the Federal government over interstate commerce, and the methods by which that power can be applied, were discussed. It was decided that the United States circuit court, sitting as a court of equity, has power to enjoin, at the instance of the attorney-general of the United States, acts of obstruction to interstate commerce, notwithstanding that the acts enjoined, or some of them, might amount to offenses against the criminal law of the United States.

While it is clearly the fact that, under our form of government, the national authority has no excuse for interfering with the relations existing between employer and employee in ordinary business transactions, it is maintained by many that as the government has control of the agencies engaged in interstate commerce, those who are employed by such agencies are also engaged in the public service, and for that reason an obligation exists on the part of Congress to enact such legislation as will tend to settle differences which may arise between railroads and their employees without causing inconvenience to the public.

EDW. A. MOSELEY,

Secretary Interstate Commerce Commission.

Commercial Courts are tribunals distinct from the ordinary civil courts, and in some countries are established in various commercial towns, or within certain districts, to settle disputes with regard to rights and obligations between persons engaged in trade, with the assistance of experienced merchants, by a brief process, according to equitable principles. The general introduction of tribunals of this sort began in the Middle Ages. The first was probably that established at Pisa, in the 11th century, and the basis of its decisions was the code of maritime laws of Pisa, confirmed by Pope Gregory VII. in 1075. At first the commercial tribunals were not so much courts established by government as arbiters of disputes, freely chosen by the merchants and confirmed by the governments. Under the name of commercial consuls such committees of arbitration were appointed in all the great commercial cities of Europe; and in the

COMMERCIAL EDUCATION

course of time they really became tribunals of justice, and were, in part at least, administered by men of legal learning and experience. Pope Paul III. confirmed the commercial consuls in Rome. Francis II. in 1560 granted to the Parisian merchants particular arbiters for the adjustment of commercial disputes; and in 1563 was established the Parisian Court of Commerce, consisting of a judge and four consuls. The same thing soon followed in all the important commercial towns of France. In London Henry VII. appointed particular commercial judges. The president of the commercial tribunal for the Hanse towns, established in 1447, bore the name of alderman. At Nuremberg, in 1621, a similar tribunal was instituted under the name of inspectors of the markets. The diets of the empire even called upon the German princes and commercial cities to follow this example, as the decrees of the empire in 1654 and 1668, and the decree of the imperial commission of 10 Oct. 1663, show. In many of these cities, as in Frankfort-on-the-Main, and in Leipsic, they were not so much independent authorities as delegates from the city councils. When commercial courts take cognizance particularly or solely of disputes relating to maritime affairs, they may be called courts of admiralty. Such a court was erected in Hamburg in 1623. The internal regulations of commercial courts commonly require that a part of the members, or at least the presidents, should be lawyers; the rest are for the most part experienced merchants, who are better adapted than regular judges to give counsel on commercial affairs, with which they are more acquainted, and which very often are not to be reduced to simple principles of law, but are to be decided according to commercial practice. Their jurisdiction commonly extends over all commercial disputes, matters of exchange, insurance, freight, bottomry, average, etc.; and further, over bankrupts, the hiring of shops and stores, clerks, and apprentices; the debts of those who receive goods from merchants upon credit; and all natives and foreigners who traffic in the place, and are found there; all shipowners, contractors for transporting goods, brokers, factors, etc., are obliged to submit to their decisions. They do as much as possible by oral investigation; and the intention of their institution is that they shall avoid the long and formal process of other courts. But when the difficulty and confusion of the matters in dispute occasion the necessity of an investigation in writing, recourse is had thereto. The greater despatch of these courts consists principally in this—that the defendant is orally summoned, once or several times, to appear before them at an early day, and if he fails to come, he can be brought by force. The complaint is then made orally, both parties are heard, and sentence is given, if possible, immediately after. But as this can seldom be done, and most cases require reference to written documents, a day not far distant is appointed for the answer to the complaint and for the evidence on both sides, and the time is seldom or never prolonged. The remedies against a sentence must be sought from the same judges, and are not easily obtained. Appeals are only allowed in very important cases, and upon the deposit of a large sum as a pledge that the final decision shall be obeyed without delay. The principal features of this process form the basis of most commercial

codes. From the sentence of these tribunals appeal is made to the court of appeal within whose jurisdiction they happen to be. The other countries where these tribunals exist are Belgium, Spain, Portugal, and Italy. See COMMERCIAL LAW.

Commercial Education. It is not known when commercial education was begun in the United States, and the facts about its subsequent development are difficult to ascertain. The opportunities for formal school preparation for a business career which are now offered in the United States may be roughly divided into four classes. First: The "commercial college" of the well-known type. Second: The business courses of the public high school. Third: Private endowed schools, more or less technical in character. This class might include business courses in the unclassifiable, but increasingly important and popular correspondence schools. Fourth: College and university courses.

The "commercial college" is the best known and almost the only well-known method of business training. Its almost spontaneous origin, its rapid and wide diffusion, its rough adaptation of primitive material to the satisfying of immediate and pressing needs, its utter disregard of all save the direct answer to current demand, its gradual recognition of present inadequacy, and its determination toward broader, fuller usefulness, mark it as a product of a young, eager and gradually maturing people. It is claimed that Bartlett of Cincinnati was the first American to assume for his undertaking the name of business "college," and he was unquestionably one of the earliest and most successful workers in this field. He gave commercial instruction to private pupils in the forties. About the middle of the fifties there were not more than a dozen commercial schools scattered in the large cities from Boston and Philadelphia to Chicago and St. Louis. They had arisen with the idea of facilitating the entrance of young men into minor positions as clerks and bookkeepers. The instruction offered was very meagre,—commercial arithmetic, a little practice in keeping accounts, and a certain amount of ornamental penmanship made up the total. A school of this kind did not require a large force of teachers,—in many cases the entire instruction was given by one man. The equipment was not elaborate and the fees were low, \$40 being an average charge, not for one term or for one year, but for an indefinite or life scholarship, and often valid at any of a large number of schools, embraced in single "chain." In those early days there were no text-books for the "commercial colleges"; and arithmetic and bookkeeping were taught by manuscript prepared by actual accountants engaged in business. The students also came primarily from business houses, a fact which necessitated the institution of evening classes. The average time spent in a business college was not more than three months. Poor as such education was, it filled a need, for commercial colleges thrived and multiplied and with success became still more successful. Increased popularity led to higher fees and longer courses, to the preparation of printed texts; life and interchangeable scholarships were abolished; the teaching force was increased; day classes largely took the place of evening instruction; school equip-

COMMERCIAL EDUCATION

ment improved and gradually these institutions grew into the apparently permanent place in public favor which they enjoy to-day.

But apart from mere numerical increase, considerations of the lengthened course of study, improved teaching, and better average preliminary preparation, there is evidence of broadening views and sounder conceptions among the business college teachers. Of course, even in the limited field of preparing for subordinate mechanical labor, good work may be done and the business college accomplished excellent results. But to-day the directors of commercial schools realize that for clerical positions more technical instruction is necessary; that a broader education pays, even if no higher position is ever won; and that the business college can equip the student through liberal and fundamental studies for subsequent promotion. These ideas produce their logical outcome, a course of study which is at once broader and more technical. The process is slow, but evidences of advance are apparent in the printed announcements of various schools, in the discussions of business teachers' conventions, and in the periodicals, weekly and monthly, issued in the interests of business education. Secondly, the necessity of pedagogical training has been recently forced upon the consciousness of business school directors. So that to-day there is a growing proportion of men and women of collegiate or other special preparation in this work. A third favorable influence on the work of the business college has been the recent and marked growth of a new form of competition, that of the public high school, a rivalry which can only prove to the advantage of each. It is not too hazardous to predict that the commercial college may hereafter be glad to see much of its work go over to the system of public education, thus giving it better equipped students and freedom to evolve a still higher course of instruction. The probability of this further evolution of the business college into a supplementary educational instrument of a somewhat better type is foreshadowed in a fourth fact favorable to commercial training, its formal recognition as a factor in public education by the University of the State of New York, whose regents trusted that this standard would create a demand for higher qualifications and lead to a repetition of the experience with the professional schools of medicine and law, when similar actions led to a large increase in the attendance at secondary schools. Conditions of recognition of a business school are in brief: Instruction by at least six teachers giving all their time to the work; an equipment worth not less than \$5,000, exclusive of buildings and fixtures; and a satisfactory one-year course, supplementary to the high school and consisting of at least 500 hours of actual instruction, in preparation for the State business diploma. Out of 30 schools in the State reported by the bureau of education, the regents granted full recognition to 11 and provisional registration to 13. Besides granting registration to business schools on these conditions, the university decided to issue business credentials, including a State business diploma and a State stenographer's diploma and corresponding certificates. The distinction between the two is the requirement of graduation from a registered high school in

the case of the diploma, but not of the certificate. To obtain the diploma, candidates must be certified as having completed also a full one-year registered business course, and must pass regents' examinations in advanced bookkeeping, commercial law, business English, arithmetic, practice, and office methods, commercial geography, and the history of commerce. If the high school course previously taken did not include United States history, civics, and economics, the regents' examination in these subjects must be passed. The requirements in general are much higher than for the corresponding subjects in the high school course, and require a higher degree of theoretical and practical knowledge.

The annual tuition fee varies in the better commercial colleges from \$50 to \$150 and even \$200 for a school year of 10 months. It is perfectly safe to say that in the quality of the work which they do, and in the equipment for this particular work, the American commercial colleges have no rivals, largely because they are engaged in the mechanical work in which Americans excel the rest of the world. They are not educational institutions in any broad sense of the term at all, but trade schools pure and simple. They train for facilities. That hundreds of the students of the colleges have been successful business men of initiative and independent enterprise simply proves that they had native ability for that sort of thing; not that this sort of training was especially helpful, though it is only fair to say that many of these men trace their start in business to the technical skill in bookkeeping, etc., which they acquired in the schools.

The Packard Commercial College opened in New York, in the spring of 1858, as a link in the Bryant and Stratton chain of business colleges, and may be considered a type of these colleges. In 1867 Mr. Packard bought the interest of his partners, Bryant & Stratton, and changed the name from Bryant, Stratton & Packard's business college to Packard's business college. The most important result of the change of proprietorship was in doing away with the life-scholarship plan under which the "chain" had been conducted, and putting an end to the interchangeability of tuition. Mr. Packard's lead was followed by the other schools, and thus the foundation was laid for individual,—if not competitive work, which has done so much to advance the character of business education in this country. In the first years of the existence of the school, Mr. Packard wrote text-books on bookkeeping for the use of Bryant & Stratton schools, which in revised form are still used. The school was first located in two small rooms in the Cooper Union building, of which it was the first tenant. In the fall of 1863 it was removed to the Mortimer block, corner of Broadway and 22d Street and Fifth Avenue, and in the spring of 1870 to the Methodist building, corner of Broadway and 11th Street, occupying the entire fourth story of the structure. Here it remained for 17 years, until it outgrew its accommodations, and moved to its present quarters. In 1865 commercial law was added to the course, and later practical English and civics. In 1872 stenography was first taught, in classes only. A very small proportion of students studied this branch, and always in connection with the commercial course. The following year the

COMMERCIAL EDUCATION

typewriter was introduced. This was the first school to teach stenography or typewriting. At the present an important feature of the work, from which no student is excused, is public speaking without any attempt at elocution. Another feature is the character record, a brief history of the student's career from the beginning to the end of his course, showing not only progress in study, but also comments by his various teachers on any special characteristics or performance that is deemed worthy of comment. It has proved not only efficacious as discipline, but is useful as reference after the student has passed out from the school and refers to it for recommendation in business. This record is never destroyed. A specimen of the student's work is also preserved. The commercial course now covers about a year and a half, or 15 months, the students entering at any time and being graduated not in classes, but as they finish the course, in greater or less time, according to their ability. The instruction is largely individual. The school graduates yearly about 150 pupils, the number in recent years being almost equally divided between the stenographic and commercial departments.

The career of Thomas May Pierce, of Philadelphia, illustrates in a similar way the growth of this department of our educational system. Starting in 1865 with the meagre curriculum then offered, he increased the scope of the work, improved the equipment, introduced regularity and system into the instruction until, when he died in 1896, he had built up what might fairly be called a typical school of the better sort. He employed some 25 instructors, and occupied quarters in one of the best office buildings in Philadelphia, where he used 15 rooms containing 10,000 feet of actual floor space. The charge for tuition was \$15 per month, or \$100 for a course of seven months.

Commercial instruction in the American public school system is only beginning to attract general attention, despite the fact that a certain amount of this work has been carried on for many years. A commercial course was not infrequently announced, although it differed from other courses in the same school only by the inclusion of a little typewriting, bookkeeping, and possibly stenography. Of late years a considerable change has come about, and high schools which had offered some business training have improved the course of study. Commercial instruction has been introduced for the first time into many schools, and gradually distinct and separate courses are being established in connection with city systems to give opportunities for the future business man, comparable to the aid already furnished to those looking forward to higher studies of a professional or technical kind. The natural order of development in this matter can be seen in a glance at the course of high school study in some typical cities. Omaha represents one stage, presenting a commercial course in which commercial arithmetic is substituted for elementary science and botany in the 9th grade of the regular English course, bookkeeping for zoology and mediæval history in the 10th, commercial law and bookkeeping for chemistry and French history in the 11th, and stenography and typewriting for American history and political economy in the 12th grade. Some question might arise as to the

advisability of the substitution in one case or another, yet there remains a fairly liberal plan of study, covering four years. Even if the aggregate of special preparation for business does not exceed the ordinary work of the year, it is preferable from an educational point of view at any rate either to place this late in the high school programme or to distribute it as indicated above. Boston with a two years' commercial course and little special business training, Pittsburg with one year's work in place of the second high school year, and Washington with a two years' course, are all in an early stage of development in this direction. Possibly Washington with a distinct business high school, even though the course of study covers only two years, is nearer the final form than Milwaukee with its new four-year commercial course. The evolution of a real secondary business school may come more easily through the addition of successive years to the course than through the gradual specializing of an ordinary high school curriculum. Indeed this view is borne out by the experience of the Hillhouse high school in New Haven with an admirably outlined three years' course and by the development in Paterson, N. J., of a commercial department in the city high school into practically a distinct school operated in a separate building by an entirely independent faculty, with a special course of two years, requiring one year of secondary study for admission. What is desirable seems perfectly clear. First of all the course of study should be at least four years. We cannot successfully defend commercial instruction in the public high school unless the work is as broadly educational as any other of the secondary courses. Secondly, the course should be thoroughly outlined as distinctly commercial. A mere substitution of a few business studies in the usual English course does not make for commercial training and such action is not only an inadequate provision for present needs, but it is destructive of future possibilities. A separate building is strongly desirable, not only on the ground of superior adaptability for the uses of a commercial school, but for absolute independence in fact, and full differentiation in the public thought. When a few such independent schools have solved the problem of commercial instruction, the ordinary schools will have a better basis for "commercial courses." With these considerations in view, we can readily say that between the two-year, strictly commercial course of Washington, for example, and the four-year course slightly specialized, of some other cities, the choice should be made not on the basis of what is offered now, but of approximation to the real type, namely, a well-planned, fully-specialized scheme of commercial training covering at least four years of secondary grade. This standard of secondary commercial training has been more nearly approximated in Philadelphia than in any other American city. In 1898 a department of commerce was established in connection with the Central high school. For reasons of expedience and economy, the department was housed in the new high school building, and much of the instruction given by the regular teaching force. Under a special director, however, the work promises to grow into an entirely differentiated institution, which may parallel the success of the

COMMERCIAL EDUCATION

manual training high schools of that city. The commercial department in the Pittsburg high school was organized in 1872 for the benefit of those who could not spend four years in the high school and yet desired some scholastic training in addition to that given in an elementary school, and especially such training as will best prepare for business positions. Its commercial studies are essentially those of a so-called commercial college, at the same time it undertakes to give general training. The curriculum is two years, one given up chiefly to general studies, the second to bookkeeping, typewriting, stenography. Almost one third of the students of the high school were enrolled in the commercial course and of these 50 per cent were girls. The commercial course in the Boston high schools is likewise only two years long. Commercial arithmetic, bookkeeping, and stenography are begun in the first year, occupying about one half of the time, while the rest is devoted to general studies like English, history, drawing, music, etc. The second year is much like the first; about one half the time is given to the study of commercial subjects. In the Hillhouse high school, New Haven, Conn., while all the other courses are four years each, the commercial course is three years. About five hours a week, approximately one third of the time, is given to strictly commercial subjects, the rest are of a general nature. Students who do the regular work well are permitted to take stenography and typewriting extra.

The work in the commercial courses of other high schools is along one or the other of the lines indicated above. It is at present a concession to a popular demand. It does not grow out of a conviction on the part of high school principals and teachers, that it is an essential part of the high school system. It will undoubtedly continue to grow and after a few good commercial high schools have formulated and solved the purpose of this kind of instruction, the average high school, profiting by their experience, will be able to organize commercial courses which will be better than those thus far elaborated. In the opinion of the writer the technical work of the commercial courses in high schools is not as well done as in the better commercial colleges.

The third division of business courses is the private secondary schools with the usual wide variation in what is offered, and a total registration of nearly 20,000. The influence of this form of competition upon the ordinary business college has been already mentioned. How widely it may be felt can, perhaps, best be seen through an outline of what is open to business students in one of the best endowed secondary schools of the country, the Drexel Institute of Philadelphia. Special departments of such schools and new endowments by private or semi-public bodies will, we may expect, play a large part in the work of business training in the United States, if the experience of other countries be a good basis for prophecy.

The Drexel Institute of arts, science, and industry at Philadelphia was founded and endowed by Anthony J. Drexel of that city. It included from the beginning in the scope of its instruction courses in commerce and finance. As the school is well endowed and independent of

State control, one may see from an examination of its work in this department a type, and, indeed, a very good type, of the best work which such institutions can do in the field of commercial education. The departments of commerce and finance consist of three special departments: (1) The course in commerce and finance; (2) the office course; (3) the evening course. The course in commerce and finance in its general features resembles the commercial schools of Europe, and is intended to place commercial education in its proper relation to other departments of educational work. The object of the course is to train the young men to do business rather than simply to record business. It has been organized with a view of meeting these conditions. It provides a liberal, and at the same time, thoroughly practical course of study, including two years' training in the knowledge of the world's industries and markets, the law of trade and finance, and the mechanisms and customs of business. The first special department gives a fundamental training including: (1) the production, manufacture, sale, and transportation of articles of commerce; (2) management of stock companies and corporations; (3) buying and selling of securities; (4) importing and exporting of merchandise; (5) borrowing and lending of money and credit; (6) advertising of commercial concerns; (7) keeping of business records. The work of this course is divided into two years. In addition to the general course in commerce and finance, described above, and requiring two years for its completion, three distinct office courses are offered. The bookkeeping course occupies one year and includes the following subjects: Bookkeeping, business forms and customs, typewriting, commercial arithmetic, English and penmanship. Another office course trains stenographers and typewriter operators. It includes stenography, typewriting, English, business forms, and office practice. The private secretary's course has been organized in response to applications that have been made to the institute for clerks fitted to do work of a different character from that required in a purely business office. The subjects included in the course are as follows: Stenography, typewriting, penmanship, English, correspondence, accounts, office practice, and business printing. Applicants for admission must show by examination, or otherwise, that they are prepared to meet the requirements of the course. The course occupies one year, divided into two terms. The department of evening classes is fully organized, and includes the following courses: (1) Beginners' course in bookkeeping and arithmetic. (2) Accountants' commercial course. (3) Office course in stenography and typewriting. The fee for each of the courses, for the entire season of six months, \$5. In the course in commerce and finance, the fee is \$25 for each of the two terms; and there is the same charge in the office courses.

The work done in the Drexel Institute is paralleled to a greater or less extent by similar work done in many private institutions, such as the Heffley School, formerly of Pratt Institute of Brooklyn, the Armour Institute of Chicago, and other schools founded by private initiative. Many of these schools have the advantage of ample funds, so that they are not as dependent

COMMERCIAL EDUCATION

upon the whims of individual students as are the commercial schools described in previous paragraphs, and on the other hand they are independent of the injurious influences at work elsewhere. I think it is not too much to say that the two years' course offered in the Drexel Institute forms in its way a model, and furnishes the basis for the elaboration of a curriculum which will compare favorably with the best of the European commercial schools of the same grade. The work done in the evening course of this institution corresponds more closely to the work of the ordinary business college as described above. The business courses of the "correspondence schools," although classified with the privately endowed schools, correspond more closely to the "commercial colleges," especially in their attention to the individual, their over-technical and practical purpose, their lack of the ideal of educational value in their work, and their freedom from the bondage of definite curriculum or class-room work. The "correspondence schools" are a factor of growing importance, but from the nature of the case their methods admit of little analysis or examination.

In the fourth class of institutions of commercial instruction, namely, the colleges and universities, the movement for instruction is of comparatively recent origin, and has affected few of these institutions. It is also a matter of interest that the attitude of these higher institutions of learning toward this subject is a radically different one from that of the other classes of institutions which we have been discussing. It has been very difficult indeed in this whole development to get the so-called commercial colleges, the high schools and other commercial courses of the various institutes in their departments of commerce to give any instruction, whatever, except in the so-called practical subjects, and of any kind whatever except of the most immediate, technical, special sort. In the colleges and universities on the other hand, even where they have been willing to accord a certain recognition to the necessity of higher education in commercial and business matters, it has been difficult to get them to give any attention, whatever, to the more practical sides of the work. While the commercial colleges have felt that political economy, commercial geography, and similar subjects were too remote and impracticable to make it worth while for them to admit these subjects into their curricula, the colleges have felt that accounting, commercial arithmetic, and similar subjects were too elementary to deserve any attention, whatever, from higher institutions of learning. The colleges and universities, moreover, have seen scores and hundreds of young men complete the old-fashioned classical courses of study, and enter the ranks of business men with ability and success. They have felt, therefore, that in a certain sense every man who wished to go into business, would find it worth his while to take the old-fashioned course. And they were very slow, indeed, to recognize that there were scores and hundreds of young men in the community who would take a higher education if an emphasis were laid upon subjects in which they were interested and which had to do with their future careers, who could not be persuaded to follow out an old-fashioned classical curriculum.

Four institutions in the United States, the University of Pennsylvania, in Philadelphia; the University of Chicago, in Chicago; the University of California, in Berkeley, Cal.; and Columbia University in the city of New York, deserve special mention for their connection with this subject of higher commercial education. Some other institutions, notably, New York University and the University of Vermont (where a department of commerce and economics opened in 1900), have important commercial schools.

In 1881 Joseph Wharton, Esq., a manufacturer of Philadelphia, gave to the University of Pennsylvania the sum of \$100,000 in order to establish a department in that institution for higher commercial training. The Wharton school of finance and economy had a curriculum two years in length and made up largely of political economy, political science, accounting, mercantile law and practice, etc. A bachelor's degree was conferred upon the graduates from this school. To enter as a regular student the candidate must have completed the first two years of the regular four years' college course. After some 10 years' experience it was decided to enlarge the course by extending it downward into the first two years of the college course, and at present the course in finance and economy covers four years and is included together with the other courses in arts and science in the so-called school of arts. The requirements for admission are the same as for other departments and represent the ordinary requirements of first-class American colleges. The faculty is composed of some 13 members. The nucleus of the course is in the study of economics and politics, supplemented by practical courses in accounting, business law, and business practice.

The growing demand for higher instruction in commercial subjects, combined with the success of the experiments in the University of Pennsylvania, turned the attention of several institutions toward the subject about the same time.

The University of Chicago, which opened its doors in October 1892, had included within its plan of work from the beginning a college of practical affairs. But it was not found practicable to undertake the organization of such a department until the year 1898, and students were enrolled in this college for the first time on 1 July of that year. The new department received the title of the college of commerce and politics, and was organized as a co-ordinate department with the other colleges of arts and literature and science. The purpose of the new college, like that of those already existing in the university, is two-fold. First, it aims at the attainment of general culture; in the second place the weight of work is put in the lines of the courses offered in certain specified departments. In the new college those departments include political economy, political science, history, and sociology. It is by no means a technical school, but is intended to give a kind of knowledge and training which may enable those who enter commerce, politics, journalism, or diplomacy to begin their work with a certain degree of equipment. The course of study covers four years. The first two years, however, are essentially the same as the first two years in one or another of the

COMMERCIAL EDUCATION

liberal courses, political economy, or political science being the only subject in these two years having a specific relation to the special work of the college. The other studies of the first two years are history, French or German, English, mathematics, science, and a small proportion of the time (about one sixth) is given to any other subject which the student may desire to pursue from among the courses offered in the university. The admission to the course covers about the curriculum of the typical four years' high school course, including at least four years' work in Latin, two in mathematics, and the usual time devoted to English history, physics, and German or French. It is during the last two years of the work that the special character of the college becomes apparent. The work of the last two years is divided into three groups: Commerce, politics, journalism and diplomacy. In the first group, commerce, there are four special sub-groups: (a) Railways; (b) banking; (c) trade and industry; (d) insurance. The student must elect, at the beginning of the third year's work in this college, one of these groups to which he wishes to devote his time. One third of the course for the next two years must be selected from within the group chosen. Another third may be selected by the student from a list of specified courses. The remaining third may be chosen by the student from any course offered by the departments of political economy, political science, history, or sociology. It will be seen that in this work the nucleus consists of economics and politics, using those terms in a large sense. But the University of Chicago has not added special technical courses in accounting, business law, business practice, etc., which forms a characteristic feature of the Wharton school.

About the same time that the University of Chicago determined to adopt a scheme of higher commercial training, a report was made to the board of trustees of the University of California, by one of its members, urging the adoption of a similar course there. After an elaborate discussion, it was decided to erect an additional college in the university, to be known as the college of commerce. The course extends over four years, similar to that of the other colleges in the university. The requirements for admission are essentially the same, and correspond to graduation from the typical high schools with the four years' course. In the first annual report of the president, after work was begun, it was stated that many details were yet to be determined, among others, the question of what degree should be conferred upon students who completed the course. In the same report the following statement is contained as to the scope of the new college: "It is the intention of the authorities of the university to place the course in commerce upon a high scientific plane, otherwise it is not justified in claiming a place in the university curriculum beside those advanced scientific, philosophical and literary courses which have already won recognition." The student will be encouraged to acquire a knowledge of them elsewhere possibly, before entering college. Thus the college of commerce will supplement, not compete with, the work of the older business commercial schools. The courses of the college of commerce of the University of California fall into the general divi-

sions: Economic studies, economic history, legal, political, historical, and geographical studies, technical studies of transportation, and of the materials of commerce, and mathematical, linguistic and philosophic studies related to commerce.

On 3 Nov. 1898, the Chamber of Commerce of the State of New York adopted the report of a committee which had been previously appointed by that body on the subject of commercial education. This report, after strongly commending the establishment of a department of sounder commercial education, both in secondary schools and in higher institutions of learning in this country, advised the appointment of a special committee by the president of the Chamber of Commerce for the further consideration of the subject of commercial education. This committee was appointed and, after various sessions and conferences with authorities of Columbia University, a report was submitted to the Chamber of Commerce recommending that the chamber assist Columbia University in the establishment of a collegiate course in commerce by the grant of certain funds. This report presents in a certain way the most complete scheme of higher commercial instruction which has thus far been submitted for the consideration of the public. It unites the practical elements in the course of the Wharton school with the wider range of the courses and subjects offered at California and Chicago. It was framed upon the plan of utilizing as largely as possible the existing courses of instruction in Columbia University, and supplementing and adding to such courses the subjects necessary to offer a complete and well-rounded scheme of higher commercial instruction. It planned a college course of commerce covering 4 years of 15 hours a week. It presupposes graduation from a secondary school, public or private, in which English, mathematics, history and natural science, and one modern language will have been systematically studied to the extent now required for admission to the college department of Columbia University. In form and in content it is adapted to students of college age, namely, 16 to 20 years. In addition to the training provided in commercial subjects, the course includes two years in writing English, two years in a modern European language, two years in European and American history, and three years in political economy and social science. It offers opportunities for the study of industrial chemistry, of a selection of three modern languages and literature, if any of these be desired.

Of the 60 hours required (4 years of 15 hours each) 4 hours are devoted to instruction in writing English; 6 hours to European and American history; 6 hours to the modern European languages; 10 hours to political economy and social sciences, and 34 hours to the study of commerce itself in its various phases. It will be observed that this curriculum comprises fundamental courses in the principles governing business combined with a detailed course in practice. It is intended that many of these latter courses, as well as some of the former, shall be given by men having an intimate personal acquaintance with actual business life. Among such courses would be those in accounting and transportation, technique of trade and commerce, commercial ethics, com-

COMMERCIAL LAW

mercial credits, insurance and commercial business. Aside from the general subjects included in liberal courses we note a course of three hours per week for one year in accounting and a similar course in economic geography; a course of two hours a week following a course in chemistry on the study of commercial products; a course of three hours a week upon the technique of trade and commerce, such as weights and measures, currency, and banking system, customs regulations, markets, fairs, etc. There are also courses in banking, accounting, commercial geography, railroad and public accounting, history of commercial theory and merchant shipping and trade routes, commercial treaties and insurance. No degree is given for this course, but a certificate of graduation testifying that the candidate has completed the work of the four years will be given to all students who pass the requisite examinations after attending the courses.

It is plain from the foregoing account that instruction in commercial subjects is to be introduced into all higher institutions of learning upon a broader scale than ever before. It cannot be maintained, however, up to the present, that our experience has been large enough to afford any accurate indication of what the ultimate form or purpose of such instruction will be. We have as yet established no independent college of commerce in the United States upon an adequate foundation. We have not even established any institution which may be fairly called a commercial high school, that is, a school with an adequate equipment, with a differentiated curriculum and with an opportunity under favorable conditions to show what it can accomplish in an educational and a technical way. None of our colleges and universities have as yet been willing to give such departments a fair opportunity to show what they might accomplish in the same directions. But with every passing year the demand for better facilities on the part of young people who desire to prepare themselves for business careers will force those who have charge of public education to give a larger space in our secondary schools to this branch of work; will lead the managers of our private secondary schools to offer better facilities, and will finally compel our colleges and universities to do something for the education of the future business man which may be compared with what they are doing for the future engineer, or lawyer, or physician, so far as the peculiarities of a business career may render such a scheme feasible. See TRADE SCHOOLS.

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Commercial Law, or Law Merchant, that branch of law which relates to trade, navigation, maritime contracts (such as those of insurance, bottomry, bills of lading, charter-parties, seamen's wages), bills of exchange, bills of credit, factors, and agents. Lord Mansfield describes it as a branch of the public law, and applied to its universal adoption the language of Cicero respecting the great principles of morals and eternal justice—"Nec erit alia lex Romæ, alia Athenis" ("Nor shall there be one law at Rome, another at Athens"). The body of rules constituting this law is substantially the same in the United States and Europe, the rules, treatises, and decisions of one country and one age being

in general applicable to the questions arising in any other. The reason is obvious why this law should be common to different nations, for it regulates those contracts and transactions in which they come in contact, being a sort of neutral ground between their hostile interests, institutions, customs, and prejudices. International law, which regulates the conduct of different nations toward each other, is distinguished from maritime law, by which private contracts between individuals are regulated.

The first known collection of marine laws was that of Rhodes, of which some fragments have come down to us in the 'Digest' of Justinian, in the title ('De Lege Rhodia de Jactu'); the collection under the title of 'Rhodian Laws,' published at Basel in 1561, and at Frankfurt in 1596, being generally considered as spurious. This title and that ('De Nautico Fœnore') recognize the first broad principles on the subject of jettison and maritime law. The law ('De Exercitoria Actione,' in the 'Digest,') also transmits to us their principles as to the liability of the owners for the acts and contracts of the master of a vessel. The remaining rules and principles by which the commercial transactions of the ancients in the Mediterranean were governed have for the most part passed into oblivion. The reason of so small a space being assigned to this branch of jurisprudence in the Roman laws may be the low estimation in which trade was held by the Romans, who prohibited men of birth and rank from engaging in commerce, of which the Code (4, 63, 3) speaks contemptuously; and Cicero says it was not fitting that the same people should be both the porters and the masters of the world. The Greeks adopted the Rhodian laws with modifications. The Athenian law on the subject of maritime loans is stated particularly in Boeckh's 'Economy of Athens' (b. i. § 23), from which it appears that the rules on this subject were very definitely settled. The laws of trade naturally followed the trade which they were designed to regulate. Accordingly we find them first revived in the Middle Ages, on the shores of the same sea, in one of the islands of which they had their origin; a collection of them being made at Amalfi, in Italy, at one time a great center of Mediterranean trade, about the time of the first crusade toward the close of the 11th century, called the Amalfitan Table, the authority of which was acknowledged throughout Italy.

The origin of the compilation of sea laws which passes under the title of 'Consolato del Mare,' though involved in some obscurity, is most generally assigned to the city of Barcelona in Spain. Some writers, however, and particularly Azuni, claim the honor of this collection also for Italy. But Casaregis, a profound commercial jurist, who published an edition of it in Italian at Venice in 1737; and M. Boucher, who published a French translation in 1808, from what he considers the original edition of Barcelona of 1494, both admit the Spanish claim. These laws are supposed by M. Boucher to have been adopted and in use as early as the 9th century, and their authority was acknowledged in all the maritime countries of Europe, and some of the articles of this collection form a part of the present commercial law of all civilized nations. It has been translated into German also, but no entire English translation has yet

COMMERCIAL ORGANIZATIONS

been made. It is an ill-arranged, confused compilation; and, though it is interesting as a historical record of the marine laws and customs of the Middle Ages, a large proportion of its provisions do not apply to the modes of transacting business and making contracts in modern times. The 'Jugemens d'Oleron' ('Laws of Oleron'), are supposed to have been compiled about the time of Richard I.; and the honor of this collection, like that of the 'Consolato,' from which it is partly borrowed, is in dispute being claimed for the French by Valin, Emerigon, and Cleirac, who say it was made by order of Queen Eleanor, Duchess of Guienne, for the use of that province, and adopted by her son Richard I., Duke of Guienne. But Selden Coke and Blackstone assert that it is an English work published by Richard I. in his character of king of England. The maritime codes of Wisby and the Hanse Towns are also of historical celebrity, and constitute a part of the legal antiquities of this branch of jurisprudence. These were the principal marine codes down to 1673, the date of the French ordinance of commerce, which treated largely of bills of exchange and negotiable paper. In 1681 was published also the French 'Ordinance of the Marine,' one of the most glorious monuments of the reign of Louis XIV. It was framed under the influence of Colbert, and merits all its celebrity, being comprehensive and including provisions, not only on many of the subjects of commercial law as we have defined its limits, but also ample regulations on the subject of prizes. These ordinances are the foundation of the present system of marine law in Europe and America. Valin's 'Commentary upon the Ordinance of the Marine,' published in 1760, is a profound, original, comprehensive, learned, and accurate work. In 1763 he also published his commentaries on the provisions of the ordinance in relation to prizes. About 20 years afterward (1782) Emerigon published his masterly treatise on insurance. The two ordinances, with the commentary of Valin and the treatise of Emerigon, made the commercial law a science, of which the principles were now settled, and their application also traced out into a great number of examples. It was now in the power of jurists, judges, and legislators to make every new question and case that should arise only a confirmation and extension, in application of doctrines which had been established upon conclusive reasons and made parts of a harmonious system; and all the commercial nations have adopted the system thus formed. It forms the basis of the French code of commerce and appears everywhere in the British, American, and continental treatises and decisions. The other French writers of greatest celebrity on this branch of law are Pothier, Cleirac, and Boucher. M. Jacobsen, a jurisconsult of Altona, has published a useful work on the subject of sea laws. The earlier English writers on commercial law were Malynes (a merchant), Molloy (a lawyer), Beawes (a merchant), Postlethwaite, Magens (a *dispatcheur*, or adjuster of marine losses, originally of Hamburg, afterward of London), and Wiskett (a merchant). But the marine law cannot be considered as having become a branch of the general science of jurisprudence in Britain until the time of Lord Mansfield, who appears to have had some considerable acquaintance with the treatise of Valin, from which

he drew principles and reasons and incorporated them into the reluctant common law. By degrees during his judicial career this branch of jurisprudence gained popularity, and from that time has occupied an important part of the British legal administration, though very few legislative enactments have either disturbed or promoted its progress. Though the maritime law in Great Britain continued in a very rude and undigested state long after it was arranged into an admirable system in France, yet the assiduity with which it has been cultivated since its introduction, and the splendid talents which have been brought to its illustration, have contributed to advance it with a rapid progress. Among the ornaments of this branch of law was Lord Stowell, judge of the British high court of admiralty. Lord Tenterden, chief justice of the court of king's bench, by his learned and well-arranged 'Law Relative to Merchant Ships and Seamen,' contributed very materially to the present advanced state of British commercial jurisprudence. The other principal writers on this law are Millar, Park, Marshall, Bayley, Chitty, Levi, Smith, Tudor, etc. Nor have the Americans been idle spectators of this improvement in a branch of law in which their industry and prosperity are so deeply interested. Though they have supplied but few original systematic treatises and digests, yet in the numerous, important, and interesting questions that have been brought under discussion before the legal tribunals, the research, comprehensive views, and logical power displayed by both the counsel and the courts, will support a comparison with those of their European contemporaries, who might derive very useful additions to their own adjudications, particularly on the subjects of merchants' shipping and insurance, from the American reports. Among the most eminent of those who have contributed to the elucidation of the commercial law are Chief Justice Marshall and Justices Washington, Story, and Blatchford, of the **Supreme Court** of the United States, and Chancellor Kent, of New York.

Commercial Organizations. The idea that is responsible for the institution of the commercial organization is of ancient origin, for it was prior to the close of the 14th century that the first French Chamber of Commerce was founded at Marseilles. For many years this was the only organization of the kind, however, and it was not until the latter years of the 17th century that a similar organization was instituted at Dunkirk, but, from that day, the idea spread so widely that such societies were founded in many parts of Europe. In 1700, one was instituted in Paris; in 1702, another in Lyons; two were founded in 1703, one at Rouen, the other at Toulouse; in 1704, one at Montpellier, and, in 1705, another at Bordeaux.

The first English Board of Trade was instituted in 1660, but it was not until a quarter of a century later that the present department was established in council, this being nothing less than a permanent committee of the privy council appointed to consider all matters in any way relating to trade and the colonies, its functions being partly ministerial and partly judicial. At the beginning of the 19th century, therefore, there were about fourteen institutions which exercised any marked in-

COMMERCIAL ORGANIZATIONS

fluence upon the home and foreign commerce of the several nations of the world. Of these there were 3 in Great Britain, 7 in France, and 4 in the United States. The Great Britain organizations included the Glasgow Chamber of Commerce, which was instituted in 1783, and the Chamber of Commerce of Edinburgh, instituted in 1785, and incorporated by royal grant in 1786.

In the United States the history of the commercial organization dates from 1768, when the first chamber of commerce was established by the merchants of New York city. Two years later, in 1770, this association was incorporated by royal charter, and during the next few years similar organizations were founded at New Haven, Conn., Charleston, S. C., and Philadelphia, Penn. The only association in the country that bore any resemblance to these institutions was a New York board of brokers, which, since their organization, about 1792, had erected the Tontine Coffee-house, where they were accustomed to meet the out-of-town merchants to discuss all questions of mercantile or semi-commercial interest. As this association was chiefly devoted to sociability and to affairs of mutual interest, and never exercised any material influence in the settlement of questions of national or international importance, it might very properly be omitted from a list of the early commercial organizations of the country.

To discover the object for which such commercial associations were founded it is only necessary to refer to the original words used in the formal organization of the New York Chamber of Commerce, this society being in many respects not only the fore-runner, but also the model upon which similar institutions in other cities of the land were afterward constructed. In reciting the terms under which it was organized, it refers to its probable field of usefulness as follows:

"Whereas, Mercantile societies have been found very useful in trading cities for promoting and encouraging commerce, supporting industry, adjusting disputes relative to trade and navigation, and procuring such laws and regulations as may be found necessary for the benefit of trades in general. . . ."

From such a statement of purposes it may be seen that the commercial organization as originally founded differed greatly from all other institutions. Not only did it interest itself in matters of local welfare, but it was so broadly national in its sympathies and work that it was able to exert a guardian's constant watchfulness over the diversified and ever multiplying commercial and industrial interests of the young republic.

The first meeting of the New York Chamber of Commerce was held at a house situated on the corner of Pearl and Broad streets. This building, which is still standing, is now known as "Fraunces' Tavern."

One of the first matters that called for the attention of the new chamber was the question of finding a suitable meeting place, and, for a time, as its records show, the members congregated in the "great room of the building commonly called the 'Exchange,' at the lower end of the street called Broad." In

1779 they removed to the "Merchants' Coffee-house," at the southeast corner of Wall and Water streets, and, in 1817, to the "Tontine Coffee-house," on the opposite corner of the same streets. In 1817, a room was set apart for their use in the original Merchants' Exchange, and, when that building was destroyed by fire, in 1835, they met temporarily in the director's room of the Merchants' Bank, on Wall street, and their later establishment, at the corner of William and Cedar streets, remained their permanent home until they finally removed to their present commodious quarters on Nassau street. From the year following its organization the Chamber of Commerce had acted under the authority of the charter granted by the king, so, at the close of the Revolutionary War, or on 13 April 1784, an act was passed by the legislature of the State of New York "to remove doubts concerning the corporation of the Chamber of Commerce, and to confirm the rights and privileges thereof." It was under this statute that the title of the organization was changed from the "Chamber of Commerce" to the "Chamber of Commerce of the State of New York."

To trace the history of the Chamber of Commerce of the State of New York is to record the development of the nation itself. Thus, for example, more than a century ago, when the government formed its code of commercial laws and regulations, it was the members of the Chamber of Commerce who determined and bound themselves reciprocally to do all in their power to prevent "the scandalous practice of smuggling." Again, about two years after the evacuation of the city of New York by the British forces several members of the new legislature determined to force the adoption of a plan to issue paper money that should, by authority of such law, be made a legal tender in the transaction of business. This matter was immediately taken up by the Chamber of Commerce, and it was largely due to its efforts and to the memorial which it drafted, in which it set forth in forcible terms the evils and immorality of such a system, that the measure was finally defeated. It was also due to the sound judgment and persistent efforts of the members of this organization that the general government, at this perilous period in its history, adopted the measures which so successfully maintained the credit of the nation. It was also the Chamber of Commerce which, in January, 1786, adopted a resolution requesting the State legislature to create a fund to be used in connecting the city of New York with the great lakes by means of an artificial waterway, a movement which finally culminated in the construction of the Erie Canal, and it was but a few years later that the members of this association gave their approval to a project for a ship-canal around Niagara Falls, and a railroad to connect Lake Erie with the Hudson River. In fact, there have been few matters for the improvement of transportation that have not met with at least the tacit recommendation of this chamber. At several periods during the history of the country the members considered the question of the insti-

COMMERCIAL ORGANIZATIONS

tution of tribunals of commerce, but, although the matter met with the approval of the association the State legislature was so largely composed of persons who were not friendly to this innovation in commercial jurisprudence that it was not until 1874 that the act was passed providing for the court of arbitration which now considers such questions. Another matter that had occupied the attention of the Chamber of Commerce from time to time was the question of the pilot laws of the States of New York and New Jersey, and it was to their efforts that the present excellent system was mainly due.

As early as 1848, at the annual meeting in that year, the members adopted formal measures pledging their aid in the organization of a savings bank for the benefit of "merchants' clerks and others" who might desire to take advantage of such opportunities for the safe deposit of their savings, and the first charter granted by the legislature for an institution of that character was clearly the result of this action. A year later the Chamber of Commerce gave its unqualified approval to Whitney's project for the construction of a transcontinental railroad from the Pacific, even memorializing Congress upon the subject; it was largely through its efforts that the National Government consented to widen the passage through Hell Gate by removing the dangerous sunken rocks from the channel, and, again and again, as the position has demanded, it has maintained its position in opposition to privateering. In 1852, when the question of the relations between the United States and Canada came prominently to the front, the action of the chamber was in favor of a reciprocal agreement with the North American provinces which should provide for the free interchange of natural productions between the two countries, embracing, as well, the rights of joint participation in the fishing and navigation privileges of the St. Lawrence River. The successful efforts of Commodore Perry to perfect treaty negotiations between the United States and Japan were made a matter of public appreciation by the chamber, a gift of a service of silver plate being the members' method of showing their recognition of the importance of that officer's services, and when the transatlantic telegraph cable had been laid, and the New and Old World had at last been connected, the members of the Chamber of Commerce appropriated the sum of \$10,000 to be applied to the purchase of gold medals to be presented to such persons in England and America who had been most prominent in the successful conduct of the great international enterprise. When the matter of a Pacific line of steamships was suggested, in 1860, a meeting of the Chamber was held on 6 September, at which the following resolution was adopted:

"Resolved, That in the judgment of this chamber an urgent necessity exists for the establishment, at an early date, of mail facilities between the city of San Francisco, in California, and Shanghai, in China, with connection at such intermediate ports as the interests of commerce may indicate."

Persistent as the members of the Chamber

of Commerce had been in their efforts to further the best interests of the United States along every possible line of national enterprise, it was not until that remarkable period in which the Southern States combined in a revolt against the Federal Government that this association was really given an opportunity to prove its loyalty to the nation. At this epoch, at a time when the business affairs of the country were in an almost inextricable tangle, the chamber, at a large and enthusiastic meeting held on 19 April 1861, responded to the President's appeal for troops by raising a sum that proved to be amply sufficient to send two regiments of the State National Guard to the defense of the National capital without delay, and to organize the several regiments of volunteers that left within a short time for the seat of war. In fact, the patriotic enthusiasm shown at this meeting was so great that when it was announced that a portion of the loan for which the Government had advertised still remained untaken, a special committee was at once appointed to see that the balance should be subscribed for without further delay, and the Treasury Department was accordingly notified that the chamber could be drawn upon for that sum at once. The entire balance, therefore, a sum amounting to fully \$8,000,000 was soon in the hands of the proper officials at Washington.

It is impossible, within the limits of space of a single article, even to give passing reference to the various occasions upon which the Chamber of Commerce has shown that its highest wishes were in sympathy with the best interests of the Government. Of one incident, however, it is necessary to speak:

In 1872, when the Senate was "hanging fire" in regard to the ratification of the Treaty of Washington, which would result in the arbitration of the difficulties existing between Great Britain and the United States, the members of the Chamber of Commerce held a special meeting on 15 May, to urge upon Congress the necessity for immediate action, both regarding the treaty itself, and the additional article thereto which had been proposed by Minister Schenck. At this meeting, after a long discussion, the following preamble and resolutions were adopted.

WHEREAS, The Treaty of Washington, referring the differences between this country and Great Britain to arbitration, has justly been regarded as a measure of great importance to the interests of civilization and peace, and the honor of proposing it belongs to this country; and

WHEREAS, Differences of opinion have arisen between the governments of the two countries respecting the proper construction of the treaty in regard to the claims for indirect damages, and a supplemental article for settlement of those differences has been proposed by the government of Great Britain, and by the President laid before the Senate for its advice, which article appears to this chamber to be sound in principle, binding the two governments to the adoption of a beneficent rule for the future, and especially beneficial to the United States and its commerce; and

WHEREAS, The failure of the treaty would be a great public calamity; therefore,

Resolved, That this chamber, without meaning thereby to imply that our government has at all erred in its construction of the treaty, and believing that the supplemental article is more than an equivalent for the claims of our government as originally presented, and feeling the importance of removing all obstacles in the way of the execution of the treaty, earnestly recom-

COMMERCIAL ORGANIZATIONS

mends the adoption of the supplemental article, and prays the Senate to ratify it.

As the sequel showed, the action of the chamber, at a time like that, when anything except war between the two countries seemed impossible, was the weight that was sufficient to throw the balance in favor of the ratification of the Treaty, and the Geneva award arbitration was the historic result.

Closely as the career of the New York Chamber of Commerce follows the history of the political, commercial, financial, and industrial development of this country, it was not the only commercial organization that was sufficiently patriotic to be able to promote the general welfare of the country. It is true that, prior to the War of 1812 there were comparatively few organizations of this character in the United States, but, soon after 1815, other cities began to institute such associations of merchants and men of affairs. Among these organizations there are many that still exist, the strongest and most successful being those that were founded by persons interested in a special trade or calling, such as that of cotton in New Orleans, leather or wool in Boston, the iron trade in Philadelphia, paper in Holyoke, the print cloth markets of Fall River and Providence, or the crockery trade of Trenton. While such associations have naturally played a part in promoting the interests of the country, their most important work has been confined to the development of the particular trade and industry in which the majority of its members are most interested. Such an organization is the Chicago Board of Trade, a body which came into existence 13 March 1848, although its active business history did not begin until 2 May 1850. From its earliest days it has been an important medium in the buying and selling of grain, animal food products, and lumber, but neither this Board, nor the similar organizations in Detroit, St. Louis, Milwaukee, Cincinnati, Toledo, Minneapolis, and several other western cities have ever devoted much effort to the general interests of the nation, valuable as they may have proved themselves from a local point of view.

In fact, the most representative body among the strictly business associations in this country, next to the New York Chamber of Commerce, is the Associated Board of Trade of Boston. Unlike most associations of this character, the Boston Board of Trade is not a promiscuous grouping of such business men as may have chanced to come together through individual inclination. Instead, it is composed of delegates regularly elected by the organized trade associations of the city. Thus, when they speak and act, they not only express their own opinions but all their actions represent the wishes of the various associations which elected them as delegates to this central body. Although the idea upon which this board is founded is a new one, the past few years of its existence have proved its practicability and usefulness.

In view of the fact that New York is the commercial metropolis of the United States it is quite logical that this city should be the home of a variety of organizations founded

to aid the merchants in their dealings, not only in home products, but in the products of all other countries with whom they hold commercial relations. Of course, with such an extensive commercial interest, an interest so diversified in its character that it extends from one end of the world to the other and embraces the products of every land, it would be impossible to imagine any single organization that should be sufficiently wide in scope to include so many and such varied interests. To facilitate the operations of this great concentration of business, therefore, it has been found necessary to organize many separate exchanges, some of which have become great commercial organizations. To describe all of them would be impossible at such a time as this, for there are more than 70 of them. First in influence, perhaps, is the New York Stock Exchange, whose dealings are confined to stocks and bonds and similar securities of this and other countries. The New York Produce Exchange, an organization of fully 3,000 members, deals in such commodities as grain, flour, provisions, lard, tallow, etc. The Cotton Exchange deals so extensively in that staple that it actually buys and sells more cotton for future delivery than any similar organization in the world. The old Petroleum Exchange once devoted its attention almost exclusively to its dealings in petroleum and mineral oils, but, as it changed both its name and its character when it became the Consolidated Exchange, it now devotes its interests more closely to its stock transactions, and has become to some extent a competitor of the New York Stock Exchange. The Mercantile Exchange confines its operations exclusively to farm products, buying and selling such quantities of butter, cheese, eggs, poultry, etc., that the aggregate of its transactions represents an enormous sum of money. So, too, the Coffee Exchange has attained such prominence that the volume of its business now exceeds that of any similar association in Europe, while such other organizations as the Wool Exchange, the Coal Exchange, the Fruit Exchange, the Metal Exchange, the Maritime Exchange, the Board of Trade and Transportation, and the many others that have come into existence in response to ever-increasing trade necessities, represent the modern expansion of the old commercial association.

In the beginning of the 19th century there were but four commercial organizations in the United States. To-day, from one end of the country to the other, there are not less than 2,000, while the following list of the principal cities of the Union and their commercial associations will be of interest, as an indication of the wide influence which such commercial bodies now exert upon the trade of the nation. For example, Boston now has no less than 48 organizations; Philadelphia has 20; Baltimore, 21; Pittsburgh, 11; San Francisco, 15; New Orleans, 11; Minneapolis, 12; St. Louis, 26; Buffalo, 16; Cincinnati, 17; Milwaukee, 10; Kansas City, 9; Cleveland, 9; Omaha, 9; Louisville, 9; and Indianapolis, 8.

COMMERCIAL TERMS

Commercial Terms. The following list is practically a short dictionary of the terms used in commercial or business life. As it is manifestly impossible to include all the terms applied in this relation, care has been taken, as far as possible, to omit those that may be ordinarily regarded as self-explanatory. Some of the more important terms are defined more fully under their respective headings.

ABANDONMENT.—Used in the customs when an importer abandons his property to avoid paying duties upon it.

ABBROCHMENT.—The act of controlling the market by monopolizing goods.

ACCEPTANCE.—An engagement to meet a bill of exchange. To make it legally correct the person against whom the bill is drawn must write his name across its face. Sometimes the word "Accepted" written above the name, is also insisted upon.

ACCEPTOR SUPRA PROTEST.—A person who, while not a party to a bill of exchange, engages to pay it if the drawee does not.

ACCESSORY CONTRACT.—An engagement made to secure the observance of a prior contract; sometimes by the same parties; sometimes by others, as in the case of suretyship, etc.

ACCESSORY OBLIGATION.—An obligation that is subordinate to another obligation, as when a mortgage is made to secure the payment of a bond.

ACCOMMODATION.—A term usually used to denote pecuniary aid in time of emergency.

ACCOMMODATION BILL.—A note, or bill of exchange, not founded upon a prior debt, but indorsed by one or more responsible parties that others may obtain credit on it.

ACCOUNT.—(a) A record of money transactions, as with a bank; (b) in business, the statement of debits and credits, with balance on hand, or due; (c) on the stock-exchange, a transaction to be settled on the regular settling-day.

ACCOUNT CURRENT.—A detailed account of business dealings still continuing between specified parties. Sometimes called an open account.

ACCOUNT SALES.—An account rendered by a broker to his principal, specifying the goods sold, prices obtained, and the net result after the deduction of commissions, expenses, etc.

ACCOUNTABLE RECEIPT.—The form of receipt given when the money or goods received are to be accounted for.

ACTIVE.—A term used to denote brisk, or lively trading, as: an active market.

ADULTERATION.—The act of debasing goods by admixture with other substances. When performed to meet the tastes and demands of the public it is called "conventional" adulteration; when done with intent to deceive it is "fraudulent" adulteration; when through carelessness it is known as "accidental" adulteration.

AD VALOREM.—According to value. Usually applied to duties levied by the customs.

ADVANTAGE.—Another term for usury; (b) the thirteenth article added to make what is commonly known as the baker's dozen.

ADVENTURE.—A speculation in goods sent abroad; a hazard.

ADVISES.—A notification respecting mercantile transactions especially in the despatching of goods.

AFFREIGHTMENT.—The act of hiring a ship in which to transport goods.

AGAINST.—Used in commerce in reference to a balance, as when an exporter draws against the merchandise he has shipped.

ALLONGE.—Sometimes called a rider. A paper attached to a note, or bill of exchange to receive indorsements for which there may be no room on the back of the bill.

ALLOTMENT.—The act of dividing a ship's cargo into separate portions that they may be assigned by lot to different purchasers.

ALLOTMENT CERTIFICATE.—The memorandum issued to an applicant for stock, showing the number of shares allotted, etc., as well as the dates on which the payments are to be made.

AMORTIZATION.—A term used chiefly to denote the extinction of a debt by a sinking fund.

APPRAISEMENT.—Chiefly used to denote the value placed upon special articles by disinterested person.

ARBITRAGE.—A branch of the Stock Exchange business, its transactions being based upon the temporary difference in the price of securities in two markets, the purchases being made in the cheaper, the sales simultaneously in the dearer market.

ARTICLES OF ASSOCIATION.—The document containing

the internal regulations of an incorporated company with all the laws by which its affairs are conducted.

ASSESSMENT.—Used on the stock exchange to denote the sum charged against stockholders to pay debts of a corporation.

ASSETS.—The property, either real or personal, that may be devoted to paying the debts of the person or corporation.

ASSIGNMENT.—The transfer of title or interest in property; chiefly used when the transfer is made for the benefit of creditors. The term is applied both to the action and to the document making said transfer.

ATTACHMENT.—A legal process directing that the person or estate of a person be taken to secure a debt, or demand, etc.

AUDIT.—Official verification of accounts and claims made to prevent fraud on the part of the person keeping the books.

AVERAGE.—The charges, over and above freight charges, paid to the master of the ship for his personal attention to the care of the goods. The small charges paid by the master for pilotage, towage, etc., are specified as "petty average."

AVERAGE ADJUSTER.—When a loss is to be divided between several interested parties the expert accountant who ascertains and states the sum to be paid by each person is called the average-adjuster, or average-stater.

BALANCE.—The difference between the liabilities and assets in an undertaking.

BALANCE OF TRADE.—The difference shown between the total value of a country's annual exports and imports.

BANK BILL.—A bill or note drawn by one bank upon another and payable according to specifications.

BANK CREDIT.—An arrangement by which, upon the giving of proper security, a person is permitted to draw to a specified extent upon the bank's funds.

BANK NOTE.—A promissory note by which the bank of issue agrees to pay its face value to bearer on demand. In the United States and Canada, where these notes are issued only by banks authorized by law, such paper passes as currency.

BANKRUPT.—A person who, having become insolvent, or unable to pay his debts in full, is adjudged a bankrupt by the court, either upon his own application or on that of his creditors.

BAR.—Commercially a bar is an ingot, or lump of gold or silver, run in a mold, but still unwrought.

BEAR.—In the stock exchange the term denotes a person who sells stocks or shares that he does not possess for future delivery in the hope that he will be able to buy them, in the meantime, at a lower rate.

BILL.—A written statement of goods delivered or services rendered with the amount of money charged for the same.

BILL-BOOK.—A book in which the merchant keeps the detailed record of promissory notes, bills of exchange, etc.

BILL OF ADVENTURE.—A document by which a master or ship-owner shows that the goods shipped on a vessel are at the venture of another person, he being responsible only for their delivery.

BILL OR LETTER OF CREDIT.—A letter requesting that credit in goods or money be given to the bearer.

BILL OF ENTRY.—A written statement of goods entered at the custom-house.

BILL OF EXCHANGE.—A written order to pay on demand, or at some specified time, a certain sum of money to a specified person, or his order.

BILL OF HEALTH.—An official certificate showing the condition of a ship's company at the time of her clearing port. Such bills are termed "clean," "suspected," or "foul," according to conditions prevailing, both on the ship and at the place from which she cleared.

BILL OF LADING.—A receipt for goods delivered to a common carrier for transportation. Usually applied to goods delivered on board ship.

BILL OF PARCELS.—Another term for Invoice.

BILL OF SALE.—A contract by which an absolute or conditional transfer of goods is made; often given as a security for debt.

BILL OF SIGHT.—A custom-house entry which permits the importer to inspect goods before they are officially accepted.

BILL OF STORES.—A license granted by customs officials by which merchant vessels are permitted to carry stores and provisions for their voyage free of duty.

BILL OF SUFFERANCE.—A license authorizing coasting vessels to trade from port to port without the payment of customs duties. Under such license all goods must be loaded and landed at sufferance wharfs.

BILLS PAYABLE AND RECEIVABLE.—Bill of exchange promissory note, or other commercial paper. The

COMMERCIAL TERMS

- person who is to pay it terms it a "bill payable," the person who is to be paid holds it as a "bill receivable."
- BOARDING-OFFICER.**—A custom-house official whose duty it is to board ships upon their arrival, to examine papers and prevent smuggling.
- BOND.**—(a) An instrument by which the maker binds himself to perform a specified act; (b) a surety; (c) goods or merchandise left in charge of custom-house or excise officers.
- BOND DEBT.**—An obligation contracted under a bond.
- BONDED WAREHOUSE.**—Often called "public" or "bonded stores." A building in which goods or merchandise is stored pending the payment of customs duties or excise tax.
- BONUS.**—(a) A premium for a loan; (b) an extra dividend or allowance paid out of accumulated profits; (c) an honorarium, or extra sum paid voluntarily as a reward for successful efforts or as a stimulus to extra exertions.
- BOOK-ACCOUNT.**—In double-entry bookkeeping, an account showing transactions in some particular commodity, without reference to the individual with whom they may have been effected.
- BOOTHAGE.**—The sum charged for the right to erect booths at fairs or in market places.
- BOUGHT AND SOLD NOTES.**—Contracts issued between brokers at the conclusion of arrangements for sales or purchases. Also called "Contract notes."
- BOUNTY.**—A premium or reward offered by a government to encourage some particular branch of industry.
- BOURSE.**—The name applied to the stock exchanges, or money markets of Continental Europe.
- BROKER.**—The middleman who negotiates the purchase or sale of stocks, commodities, etc., for others, accepting a commission, called "brokerage," in return for his efforts. There are many classes of brokers, the following being examples: Bill-brokers, insurance brokers, cotton brokers, stock exchange brokers, curb brokers, ship brokers, etc.
- BROKER'S NOTE.**—A voucher containing the particulars of a transaction delivered by a broker to his principal.
- BUCKET SHOP.**—While nominally established for the conduct of a stock exchange business, the fact that there are neither transfers nor deliveries of the stocks or commodities dealt in has led the courts to determine that its transactions are nothing more than gambling wagers.
- BULL.**—On the stock exchange, one who purchases stock for future delivery, hoping to sell at a higher price before the time of settlement.
- BULLION.**—Chiefly used to denote uncoined gold and silver in bars and other forms.
- BY-BIDDER.**—A person employed to increase the bids upon goods sold at auction.
- CALL.**—(a) A privilege secured by contract and a consideration, of claiming and receiving either a certain number of shares of some particular stock at a stated price and within a given period, or the difference in value between the date of the demand and the date of the contract. (b) A notice of withdrawal of bonds, upon receipt of which holders must present them and receive payment of the principal and whatever interest may be due. (c) An assessment upon stockholders to pay installments or losses.
- CALL LOAN, or CALL MONEY.**—Money loaned on condition that it may be recalled at any time.
- CAMARAGE.**—The rental paid for a storage house.
- CANCEL.**—A bill, or bond becomes void when the word "Cancelled" has been written across it.
- CARRIER.**—One who conveys goods or persons for hire. A "common" carrier carries as a business; a "private" or "special" carrier, by special agreement.
- CASH.**—A term ordinarily applied to coin, and other currency, although readily negotiable securities are sometimes included. The term "hard cash" is also frequently applied to money actually in hand.
- CASH ACCOUNT.**—An account of money transactions: receipts, payments and balance on hand; (b) a term used in banking to denote the credit given to depositors on receipt of a properly secured bond for the repayment of the amount advanced with interest.
- CHAMBER OF COMMERCE.**—A local association composed of men interested in commerce and organized for the protection of trade interests.
- CHARGE.**—(a) To fix as a price; (b) to set down at a price; (c) to enter on the debit account.
- CHARTER.**—(a) A document given in evidence of a government grant conferring privileges on the fulfillment of specified conditions; (b) the hiring of a ship by special contract.
- CHARTER PARTY.**—The written agreement under which a vessel is leased.
- CHECK.**—To all intents a check is practically a bill of exchange, being a written order for money drawn on a banker.
- CHEST.**—The box-shaped case in which such goods as tea and indigo are packed for shipment is commercially known as a "chest."
- CIRCULAR LETTER.**—A communication conveying the same information or instructions to a number of interested persons.
- CIRCULAR NOTE.**—A letter of credit issued on foreign firms by bankers to travelers.
- CIRCULATING MEDIUM.**—The recognized means of making payments.
- CLEARING.**—A term used in several branches of trade, and usually to denote different actions. A vessel is "cleared" when it has furnished all particulars about its crew and cargo when about to leave port. In importations goods are "cleared" when all duties and dues have been paid. In banking, "clearing" is a term applied to a plan by which checks and bills are exchanged daily.
- CLEARING HOUSE.**—An institution where local banks meet daily to settle their mutual claims. Its certificates of deposit are negotiable only between members of the association.
- COLLATERAL SECURITY.**—Any property given to secure the performance of a contract and that is to be surrendered upon the performance of the latter.
- COMMERCIAL PAPER.**—Drafts, bills of exchange, and other negotiable paper given in the course of business.
- COMMISSION.**—The allowance given to the agent, or person delegated to buy or sell goods in the interests of another.
- COMMUTATIVE CONTRACT.**—A contract in which each of the parties interested gives and receives an equivalent.
- COMPOSITION.**—The sum, or rate agreed upon in compounding with creditors. When a contract is signed by which the creditors agree not to molest their debtor the document is termed a "composition deed."
- COMPOUND INTEREST.**—Interest paid not only on the principal but on the interest that accrues thereon, the latter being added to the original amount.
- CONCESSION.**—A grant or privilege made by governments to individuals to encourage them in carrying out undertakings that promise to be mutually beneficial.
- CONDITION OF SALE.**—A written statement of the particular terms under which property may be sold at auction.
- CONSIGNMENT.**—Goods sent for sale or delivery according to agreement. The sender is called the "Consignor;" the recipient, the "Consignee."
- CONTENT.**—A term used in the customs to denote the paper given by the master of a vessel before she clears outward. It details the vessel's destination, describes goods shipped, etc.
- CORNER.**—Commercially the term is used to denote the fact that some person or clique has purchased so largely of a certain stock or commodity for immediate and future delivery that nearly the whole available supply has been monopolized.
- CONTRABAND.**—Goods exported or imported contrary to the law of a country.
- CORPORATION.**—A company of individuals whose acts are recognized by law as those of a single person. A corporation which fills its own vacancies is known as a "close" corporation.
- COUPON.**—A warrant for the payment of interest or dividends that may be detached from bonds and presented for collection when such payments fall due.
- COVERING SHORTS.**—The term "to cover shorts" is used in the stock exchange to denote the fact that some person has bought in such stocks as he had previously sold short to enable him to meet his engagements or to protect himself against loss.
- CREDIT.**—A term applied when goods are sold upon the understanding that they are to be paid for at a future date. The time given for such payment denotes whether the accommodation shall be known as a "long" or a "short" credit.
- CURRENCY.**—The legal coinage, or that which is current as a medium of exchange.
- CUSTOMS DUTIES.**—The tax, or duty imposed by law upon the exportation or importation of merchandise.
- DAYS OF GRACE.**—The number of days which may expire after payment is due before said payment may be demanded. In the United States and Canada 3 days of grace are usually allowed, except on "demand" or "sight" paper, although some States, like New York, have abolished all grace in the payment of obligations.
- DEAD-PLEDGE.**—Lands or goods pawned, or pledged.
- DEBENTURE.**—(a) A deed given by a corporation as an evidence of debt which may be negotiated like any other investment paper; (b) in the customs the term is used to denote a certificate of drawback indicating that the holder is entitled to a refunding from the

COMMERCIAL TERMS

- government on the re-exportation of goods upon which the duties have been paid.
- DEBIT.**—That which is entered upon an account as a debt.
- DEL CREDERE.**—An additional commission paid to a factor, or agent when he binds himself to be responsible for the transaction of business, but also to guarantee the solvency of those with whom he contracts.
- DEFERRED BONDS AND SHARES.**—Bonds entitling the holder to draw interest at a gradually increasing rate to a specified point at which they assume the character of ordinary active bonds. Holders of "Deferred shares" do not participate in the profits until the expiration of a specified time.
- DELEGATION.**—A term used in banking to denote a non-negotiable letter employed by bankers in transferring a debt or credit.
- DEMURRAGE.**—A charge made as compensation for the detention of a freighter in loading or unloading.
- DEPOSIT.**—(a) A sum of money placed with bankers under agreed conditions; (b) partial payment on goods before delivery as a security for the order.
- DISCOUNT.**—Allowance made on bills paid before they are due. The term "At a discount" implies that an investment is below par. "Discount day" in banking is the day set apart for the discounting of bills or notes.
- DISHONOR.**—When an acceptor fails to pay a bill when due it is said to be "dishonored."
- DIVIDEND.**—(a) An individual share of profit due upon an investment. (b) The payment made by a bankrupt to creditors in adjusting the difference between his assets and liabilities.
- DOCUMENT BILL.**—A bill of exchange accompanied by such security as a bill of lading, an insurance policy, etc., given in return for an advance in money.
- DRAFT.**—A term used in many connections, but usually as a bill of exchange.
- DRAWBACK.**—Duty paid on imported goods refunded because of re-exportation.
- EARNEST MONEY.**—Money paid to bind a bargain.
- EMBARGO.**—An official seizure of ship or merchandise to prevent its removal from port.
- EXCHANGE.**—(a) To part with in return for an equivalent; (b) a place where merchants, brokers, etc., meet daily to transact business.
- EXCISE.**—The tax imposed upon certain articles of home production. Also called the "Internal Revenue tax."
- FISCAL.**—Pertaining to financial matters, as the "fiscal agent," the "fiscal year," etc.
- FIDUCIARY CAPACITY.**—A relation of trust and confidence. Thus a "fiduciary loan" denotes a loan granted without other security than confidence in the borrower's honor.
- FLOATING CAPITAL.**—A sum ready to be used as occasion may demand.
- FLOATING DEBT.**—An unfunded debt.
- FLOTSAM.**—Goods from a wreck that are found floating.
- FORCE MAJEURE.**—Circumstances that are beyond human control.
- FORECLOSE.**—To deprive a mortgagor of his right to redeem the property mortgaged.
- FORESTALL.**—To corner the market.
- FORWARDING NOTE.**—A descriptive note sent by the consignor with goods conveyed by carrier.
- FRAUGHT MONEY.**—Money paid for transportation of goods.
- FUNDS.**—The accumulation of money, or its equivalent, devoted to, or available for the maintenance of some business or institution, or for some other specific purpose.
- GOODWILL.**—The value supposed to attach to an established business connection.
- GROSS.**—(a) Weight and amount without deduction for any purpose; (b) twelve dozen, or 144 articles.
- GUARANTEE.**—An engagement to fulfill another person's obligations providing he may fail to do so.
- HONOR.**—To meet a claim, or obligation at the time when it is due.
- HYPOTHECATION.**—(a) The act of pledging, by delivery or otherwise, stocks, bonds, etc., as security for obligations; (b) the mortgage of a vessel or her cargo.
- IMPOST.**—A tax or duty laid on goods imported.
- INDENTURE.**—A sealed agreement between two or more parties.
- INSOLVENT.**—A person whose assets are insufficient to enable him to meet his liabilities.
- INTEREST.**—The sum paid for the use of money or the profit derived from the employment of capital.
- INVESTMENT.**—A sum of money expended with the hope of making profit.
- INVOICE.**—An account sent to the buyer of goods in which the seller gives all necessary details respecting quantity and price.
- JETSAM.**—That part of a ship's cargo that sinks in time of wreck.
- JOINT STOCK COMPANY.**—An association the member-
- ship in which is attained by the purchase of stock which is issued in shares.
- JUDGMENT NOTE.**—A promissory note to which a power of attorney to appear and confess judgment for the sum named has been attached.
- LAMB.**—A slang term used in the stock exchange to denote a person who has been deceived into making losing investments.
- LAY-DAYS.**—The stipulated number of days allowed to a charterer for the shipping or unloading of a vessel.
- LEASE.**—The grant of temporary possession, as of lands or tenements, for a fixed compensation, and a specified length of time. The person granting this right is called the "Lessor;" the person accepting the grant is the "Lessee," or "Leaseholder."
- LETTER OF CREDIT.**—A document, usually issued by bankers, authorizing their agents to pay a sum of money to the bearer.
- LIGHTERAGE.**—The sum paid for unloading a ship's cargo by means of a lighter, or barges.
- LIMITATION.**—Many statutes fix a period after which debts cannot be collected. This period of limitation ranges from 6 to 20 years.
- LIMITED LIABILITY COMPANY.**—A concern the shareholders in which cannot be held responsible for more than the nominal value of their own shares.
- LIQUIDATION.**—The act of winding up a business.
- LOCUM TENENS.**—One who temporarily holds the place of another.
- MANIFEST.**—A statement giving full details of a cargo which must be prepared before the sailing of a ship.
- MATURITY.**—The time when notes, drafts, etc., become due.
- MEASUREMENT GOODS.**—Light goods which are charged for carriage by bulk instead of weight.
- MEMORANDUM SALE.**—The act of sending goods to a proposing buyer subject to his approval, title vesting in the intending seller until they have been accepted.
- MORTGAGE.**—A method of pledging property for debt in which the lender may foreclose upon the security if the interest agreed upon is not maintained.
- NEGOTIABLE PAPER.**—An evidence of debt which can be transferred by indorsement to another.
- NET.**—The sum remaining after the deductions for expenses, etc., have been made.
- PAR.**—The face value of shares or bonds.
- PASS BOOK.**—A small book issued by bankers in which to show the receipts and payments made on a customer's account.
- PERMIT.**—The written authority to remove goods on which duty has been paid from the custom-house is called the revenue officer's "permit."
- POST-DATE, To.**—To date ahead of the actual date.
- PREMIUM.**—When shares or bonds are quoted above par they are said to be "at a premium."
- PRICE CURRENT.**—A list published by a merchant showing the prices at which goods are to be sold for a fixed period.
- PRIME COST.**—The first, or original cost of an article.
- PRICE OF MONEY.**—The rate of discount at which money may be borrowed.
- PROCURATOR.**—The person who is empowered to act for another.
- PROCURATION-FEE.**—The sum taken for effecting loans of money.
- PRO FORMA INVOICE.**—A statement issued in the form of an invoice to be presented in lieu of a formal invoice at the custom-house, where, if duly verified, it is accepted as a substitute.
- PROMISSORY NOTE.**—A written agreement to pay a specified sum of money at a certain time.
- PROOF IN BANKRUPTCY.**—An affidavit in which a creditor declares that his claim to bankrupt's estate is correctly stated.
- PRO RATA.**—To distribute proportionally.
- PROTEST.**—A note or check is said to have gone to "protest" where there were no funds to meet it.
- PROXY.**—A term applied both to the person who acts for another and to the document that gives him the power to act.
- PUTS.**—An option to deliver, or not deliver, at a future date. A term used in stock exchange speculation.
- QUOTATION.**—The prices at which goods are offered.
- RATE OF EXCHANGE.**—The sum given in one country's currency for the currency of another country. Rates of exchange fluctuate widely, being subject to many influences.
- REBATE.**—A discount given by bankers in return for ready-money payments.
- RESERVE.**—The sums kept for the purpose of enabling the holder to meet special contingencies.
- SALVAGE.**—A term applied both to the goods rescued and to the money paid for their rescue from damage or loss, especially at sea.
- SCRIP.**—A provisional certificate, or receipt for money paid as installments for shares to be exchanged for a

COMMERCIAL TREATIES — COMMERSON

more formal certificate when conditions agreed upon have been complied with.

SECURITIES.—Documents given as an evidence of debt.

SET-OFF.—The balancing of one debt by another.

SHARE.—The unit, or one of the entire number of equal parts into which the capital stock of a company or corporation has been divided.

SILENT PARTNER.—A person who maintains an interest in a business enterprise but who takes no active part in its management.

SINKING FUND.—A fund constituted for a special purpose; usually for the redemption of bonds.

STOCK.—(a) The accumulation of merchandise. (b) The share capital of a corporation.

SUPERCARGO.—The person who has charge of a ship's cargo.

SUSPENSION OF PAYMENT.—The act of discontinuing the payment of debts because of insolvency.

TARE.—A deduction made from the gross weight of goods to allow for the weight of the box, or package containing them.

TENDER.—An offer, in writing, to perform some specific service or to supply certain articles at a specified rate and upon stipulated conditions.

TONTINE.—An annuity, in which the subscribers to the loan share under the benefit of survivorship, the share of each increasing as other subscribers die until the whole reverts to the last-living subscriber.

TRET.—A now almost obsolete custom of making an allowance to purchasers who were compelled to transport their own goods.

TRUCK SYSTEM.—The system of paying employees partly or wholly in goods instead of money.

TRUSTEE.—A person entrusted with the management of the affairs and property of others.

ULLAGE.—The estimated measure of the empty portion of a cask.

UNBALANCED BID.—A bid for the performance of work in which the rates specified for each of the various kinds of labor or material required have been based upon an erroneous estimate of the quantities of each, thus making a high bid appear as a low estimate.

UNEARNED INCREMENT.—The increase in the value of land resulting from such general causes as the increase of population, etc., as distinguished from the increase due to the efforts of its individual owner.

USANCE.—The time allowed for the payment of bills of exchange drawn on foreign countries. The term is also used as another word for interest.

VOUCHER.—A written document in proof of money transactions.

Commercial Treaties, compacts between countries for the purpose of improving and extending their commercial relations; each country engaging to abolish or to reduce to an agreed rate or otherwise modify the duties on articles of production and manufacture imported from the one country into the other. They are usually for a limited period, but may be renewed and modified according to changing conditions. In these treaties the phrase, "most favored nation," implies concessions equal to the most favorable ones granted under similar treaty. The first treaty of commerce made by England with any foreign nation was entered into with the Flemings in 1272; the second was with Portugal and Spain in 1308. The first commercial treaty made by the United States with China was entered into in 1844, and among other things provided that "If additional advantages and privileges of whatever description be conceded hereafter by China to any other nation, the United States and the citizens thereof shall be entitled thereupon to complete, equal, and impartial participation in the same." This provision has substantially been repeated in all subsequent treaties between the United States and China, and forms the basis on which the United States demanded of the Powers of Europe a recognition of the "open-door policy" in their spheres of influence in China.

The commercial treaties of the United States have been based almost wholly upon the prin-

ciple of reciprocity. Among the most noteworthy of recent years are the following:

Country	Date	Subject
Brazil	1891	Manufactures.
San Domingo	1891	Foods, manufactures.
Salvador	1891	Foods, merchandise.
Germany	1892	Foods, raw materials.
Great Britain	1892	Manufactures, etc.
Nicaragua	1892	Foods, implements.
Guatemala	1892	Manufactures, etc.
Austria	1892	Cotton goods, etc.
Spain	1892	Miscellaneous.
France	1898	Miscellaneous.
Portugal	1899	
Italy	1900	Miscellaneous.
Germany	1900	Food products, etc.

and several others of wider scope which require confirmation by the Senate.

Commercial treaties have also been concluded with Colombia, Honduras, and Venezuela. The terms upon which the United States negotiates treaties of this character have been twice indicated in tariff bills (1890 and 1897), the last one being known as the Dingley Act; but under the Constitution the President and Senate have full right to make such treaties. Concessions to foreign governments in respect to duties are authorized by the Dingley Act upon certain specific conditions, of a reciprocal character, to be ascertained by diplomatic negotiation. The great expansion of the commerce of the United States in recent years has led the government to extend the application of commercial reciprocity wherever practicable. The last tariff bill provided certain commercial arrangements by the President alone, and for treaties under certain limitations which required approval by Congress. To execute this law the President appointed a special commission plenipotentiary, in whose charge the negotiation of such treaties was placed. John A. Kasson was appointed the first reciprocity commissioner. As a further means of promoting the foreign trade of the country, a movement was inaugurated during the congressional session of 1899-1900 for the creation of a separate executive department to have charge of the purely commercial affairs of the nation. In 1903 a new department of "commerce and labor" was created, and a secretary of commerce and labor was added to the President's Cabinet.

JOHN A. KASSON,

United States Reciprocity Commissioner.

Commercy, kō-mār-sē, France, a town in the department Meuse, on the left bank of the Meuse River, about 180 miles east of Paris. In its ancient castle the Cardinal de Retz wrote his memoirs. The town is tolerably well built, and has tanneries and breweries. The cavalry barrack was once the residence of King Stanislas of Poland. Pop. 7,000.

Commere, Léon François, lā-ôn frän-swä kō-mār, French genre and portrait painter: b. Trelon, France, 10 Oct. 1850. He studied under Cabanel and obtained the Grand Prix de Rome in 1875. His famous portrait of a ballet dancer, called 'A Star' (1882), is owned in the United States.

Commerson, kō-mār-sōñ, Philibert, French botanist: b. Chatillon-les-Dombes 18 Nov. 1727; d. Mauritius 1773. At the request of Linnæus he composed a treatise on the 'Fishes of the Mediterranean,' the most important ichthyological work that had as yet appeared. In 1767, at the command of the king of France, he ac-

COMMINATION — COMMITTEE

accompanied Bougainville on his voyage round the world. He died on the Isle de France (Mauritius), after residing there for about four years. He wrote, among other things, a botanical martyrology — a biography of those who have fallen victims to their efforts in the cause of botany. He left his plants, drawings, and papers to the royal cabinet at Paris. *Commeronia*, a genus of the family *Sterculiaceæ*, was named in his honor.

Communa'tion, an office in the liturgy of the Church of England, appointed to be read on Ash Wednesday (the first day of Lent), containing a recital of God's anger and threatenings toward sinners.

Communes, kō-mēn, or **Comines**, France and Belgium, towns on opposite sides of the Lys, eight miles north of Lille. The one on the right bank is in the department of the Nord, France, and communicates by a drawbridge with the other, which is in the province of West Flanders, Belgium. Anciently they formed a single town, which was fortified and had a castle, in which the celebrated historian, Philip de Commines, was born. The manufactures are chiefly ribbons and cotton goods. Pop. of French Communes, 6,000; of Belgian Communes, 5,829.

Commissariat, kōm-mīs-sār-ī-āt, that department of an army which provides provisions, forage, camp equipage, and all the daily necessities other than those connected with actual fighting. In the United States army the provisioning, etc., is in the care of the Department of Subsistence, presided over by a commissary-general, assisted by 5 assistant commissary-generals, ranking as colonels and lieutenant-colonels; 9 commissaries of subsistence, ranking as majors, 8 as captains, and 200 commissary sergeants. There are also regimental commissaries of the rank of captain. The transportation of supplies belongs to the quartermaster-general's department. In the British army the duties of the commissariat have been managed by different bodies at different times, and at present there is no department so named. The commissariat duties now partly fall on the Army Service Corps, while there is also an ordnance store department for the supply of warlike stores. It is only in the latter body that there are officers designated commissaries.

Commissary, an officer of a bishop who exercises spiritual jurisdiction in remote parts of a diocese, or one entrusted with the performance of duties in the bishop's absence. For this term in its military sense, see **COMMIS-SARIAT**.

Commission. (1) Formal act of trust; a warrant by which any trust is held or authority exercised. (2) A written document investing a person with an office or certain authority. (3) A certificate issued by authority by which a military officer is constituted; as, a captain's commission. (4) A body of persons joined in an office of trust, or their appointment; as, a building commission. (5) Brokerage, allowance, or compensation made to a factor, agent, etc., for transacting the business of another; as one per cent commission on sales. (6) A warship is said to be "in commission" when she is fitted out for service and her commanding officer has taken charge under his commission (see

definition 3, above). (7) In an official sense, a commission is a legally created body of persons invested with limited but well-defined jurisdiction, as the Interstate Commerce Commission, the Civil Service Commission, the Anthracite Coal Commission, etc.

Commission of Bankruptcy.—A commission appointed to investigate the facts relative to an alleged bankruptcy and to secure all available assets and effects for the creditors concerned.

Commission Merchant.—One who sells goods on behalf of another, being paid by a certain percentage which is called his commission.

Commissionaire, kōm-mīs-sē-ō-nār, the attendant attached to continental hotels, who waits the arrival of the trains to secure customers, to look after their luggage, etc. They may also be employed as guides or otherwise. In London, Edinburgh, and elsewhere, bodies of commissionaires have been established, the men being drawn from the ranks of military pensioners of undoubted character.

Commis'sioner, a member of a commission. See **COMMISSION**.

Com'missure, an anatomical term applied to nervous connections between adjacent parts of the nervous system. Though it is not always used in quite the same way, the general signification of the term, and the physiological import of the structure, is that of a uniting bridge.

Commit'tee, one or more persons elected or deputed to examine, consider, and report on any matter of business.

Large deliberative assemblies, with a great variety of business coming before them from time to time, are unable, when sitting as a whole, sufficiently to discuss and investigate many subjects on which they are obliged to act. Committees, therefore, are appointed to examine and report to the assembly from which they are selected. In the legislative bodies of the United States, and in the British Parliament, in fact, in all legislative bodies in representative governments, there are committees for various purposes. What are known as "standing committees" and "grand committees" are regularly appointed at the beginning of every session, and have a definite class of subjects with which to deal, the object being to divide the work of the assembly among several bodies, and so facilitate the progress of legislation. In the British Parliament there were formerly four grand committees — of Religion, of Grievances, of Courts of Justice, and of Trade, but they fell into disuse, and were discontinued in 1832. Another ancient committee is that of Privileges, which is still appointed at the beginning of every session, but has seldom any work to do, questions of privilege being generally laid before a select committee specially appointed. Two grand committees have again been constituted since 1882, to deal respectively with Law and Courts of Justice, and with Trade. In the United States Congress the standing committees are very numerous. Among the most important of them in both Senate and House (though each House has not the same committees) are those on Appropriations, Commerce, Elections, Foreign Affairs, Judiciary, Military and Naval Affairs, Rules, and Ways and Means. (See **CONGRESS, UNITED STATES**.) "Select committees" are appointed by both Houses of the British Parlia-

COMMITTEE OF PUBLIC SAFETY

ment and of the United States Congress to take up special questions and investigate them previous to legislation. In these witnesses may be examined upon oath, and evidence of all kinds brought forward, the proceedings being such as could not be carried on before the whole House. When their reports are given in, measures may be based upon them and passed into laws. What is known as a Committee of the Whole House can only be regarded as a committee in so far as its procedure is concerned, since it consists of all the members who are present. Matters of great concernment (as supply, ways and means, etc.) are usually referred to a committee of the whole House, in which bills, resolutions, etc., are debated and amended till they take a shape which meets the approbation of the majority. The sense of the whole assembly is better taken in this way, because in all committees every one speaks as often as he pleases. When, in the British Parliament, the House is in committee, the chair is regularly taken by the chairman of committees, a member who receives a salary and holds the post during the duration of the Parliament, acting as deputy speaker. (See PARLIAMENT.) When the House is desirous of forming itself into committee, the speaker, on motion, puts the question whether the House will resolve itself into a committee of the whole, to take into consideration such a matter, naming it. The previous question cannot be put in committee; nor can the House in committee adjourn, as ordinary committees may, but, if the business is unfinished, must hold an entirely new sitting. If the business is finished, the chairman reports, either immediately, or, if the House wish, at a later period.

In law, a committee is a guardian appointed to take charge of the person or estate of one who has been found to be of unsound mind, or who is laboring under some other disability. The next of kin is usually selected, but the appointment rests in the discretion of the court. It is the duty of the person appointed to take care of the incompetent.

Committee of Public Safety (*Comité du Salut Public*), a body elected by the French Convention, 6 April 1793, from among its own members, at first having limited power conferred upon it—that of supervising the executive and of accelerating its actions. Later, its powers became extended; all the executive authority passed into its hands, and the ministers became merely its scribes. At first composed of nine, it was increased to 12 members—Robespierre, Danton, Couthon, St.-Just, Prieur, Robert-Lindet, Héroult de Séchelles, Jean-Bon St.-André, Barrère, Carnot, Collot d'Herbois, and Billaud Varennes. In the terms of its constitution the members should have been elected only for one month, but all the above-mentioned held their seats for a whole year. The prevailing party acted on the ground that France, threatened from within and without, could not be governed as if at peace, but could only be saved by desperate measures, as in times of the greatest danger. But after the downfall of the Girondists, 1 and 2 June 1793, when the Mountain, on the recommendation of the Committee of Safety, declared that the population of France consisted of but two parties—patriots and enemies of the Revolution—and consigned the latter to the persecution of all good citizens, terror took the place of law. From

this time the committee governed the Mountain party, and through it the Convention. As the sole rule of his conduct Robespierre declared that the mainspring of a popular government in a state of revolution was *la vertu et la terreur!* Carnot confined himself to the direction of the armies, and left to his colleagues the affairs of the interior. At the motion of these men the new constitution was suspended for a time, and the revolutionary government conferred on the Committee of Safety by a decree of the Convention of 4 Dec. 1793. The committee now instituted in all the communes of the republic, as judges of the suspected, revolutionary committees, composed of the most furious zealots: the number of these new tribunals was as great as 20,000. The last remaining forms of regular process were abolished; their place was supplied by violence, and often by avarice and folly. In this time of internal revolutions, and danger from without, it was not in the power of man to restrain the exasperated fury which probably alone prevented France from being conquered. Finally Danton, who had absented himself for a time from the committee on account of the influence of Robespierre, declared himself against the system of bloodshed; and Robespierre himself acquiesced in the condemnation of the ring-leaders of the Paris mob (24 March 1794), among whom was Hébert; but soon after (5 April) Danton, with Héroult de Séchelles, was himself overthrown by Robespierre. Till 28 July 1794 the latter now remained master of the lives of 30,000,000 of men. He appointed Fouquier-Tinville public accuser. Prisons were multiplied and crowded; the prisoners were cruelly treated, betrayed by spies, and condemned without being allowed the privilege of defense; the property of all imprisoned on suspicion was confiscated, and the guillotine remained *en permanence*. The same violence was practised in the provinces by some of the delegates of the committee. Among the numberless victims of the system were the noble Malesherbes and the celebrated Lavoisier. The members of the Committee of Public Safety and of the *comité de sûreté générale* at last disagreed among themselves. Each committee contained three parties. These, and not Tallien, were the real causes of the 9th Thermidor (27 July). In the committee of public safety Robespierre, Couthon, and St.-Just (*gens de la hautemain*) formed one party; Barrère, Billaud, and Collot d'Herbois (*les gens révolutionnaires*) another; and Carnot, Prieur, and Lindet (*les gens d'examen*) a third. In the *comité de sûreté générale* one party comprised Vadier, Amor, Jagot, Louis (*du bas Rhin*), and Voulland (the *gens d'expédition*); to a second belonged Danton and Lebas (*écouters*); to the third Moise Bayle, Lavi-comterie, Elie Lacoste, Dubarran (*les gens de contrepoids*). Robespierre attempted to remove the unyielding Carnot from the Committee of Safety. On the other hand Billaud Varennes labored to effect Robespierre's downfall. Couthon, St.-Just, the Jacobins, and the commune of Paris alone adhered to Robespierre. But when St.-Just actually proposed in the committee a dictatorship for the safety of the state an opposition was raised against Robespierre in the National Convention by Vadier, Collot d'Herbois, Billaud Varennes, and especially by Tallien and Fréron; the dictator and his faction were proscribed, and the victory of Barras (q.v.)

COMMITTEES OF CORRESPONDENCE — COMMITTEES OF SAFETY

on the 9th Thermidor brought Robespierre, his brother, St.-Just, Couthon, and others, 105 in all, to the scaffold, 28 July. The Convention now recovered its authority; the Jacobins and the partisans of terrorism (*le queue de Robespierre*) were completely overthrown; at the same time the Convention gave the Committee of Safety and the revolutionary tribunal a more limited power and jurisdiction. The bloody despotism ceased; and when a new constitution introduced (28 Oct. 1794) a directorial government (see DIRECTORY), the Convention was dissolved, and with it sank into its grave the revolutionary government, the reign of terror, and the Committee of Public Safety.

Committees of Correspondence, in American history, public functionaries of a type first appearing in England, created by the parliamentary party of the 17th century in their struggles with the Stuarts. In 1763, when the English government attempted to enforce the trade and navigation acts on America after the Peace of Paris, the colonial leaders advised the merchants to hold meetings and appoint committees to memorialize the legislature and correspond with each other to forward a union of interests. This was done in Massachusetts, Rhode Island, and New York 1763-4. On 13 June 1764 the Massachusetts General Court appointed a committee to communicate to other colonial governments its instructions to its agent in London, to protest against the Sugar Act and the proposed Stamp Act. When the latter was passed in 1765, the Sons of Liberty formed committees of correspondence to organize resistance. Samuel Adams, during the decade 1764-74, constantly urged the adoption of this plan by the patriots of every town and county in each colony, and moved the general court to that effect in 1770-1. A few public bodies in the country appointed such committees, but there was no general concert. The payment of judges' salaries by the royal government in 1772 was seized upon by Adams as a fresh incitement, at first with scant effect, but on 21 November a slender town meeting at Faneuil Hall, Boston, appointed a correspondence committee of 21 to communicate with other Massachusetts towns concerning infringements of popular rights. It consisted of the foremost popular leaders—Adams, Otis, Warren, Quincy, etc.—and until late in 1774 (see COMMITTEES OF SAFETY) remained the real executive of the town and largely of the province. A report of its first meeting was printed and sent to all the towns and to other provinces, and in a few weeks 80 Massachusetts towns had appointed similar committees, many more doing so in a short time. No fresh places in other colonies joined, though the report was printed in their newspapers. But the royal commission to investigate the burning of the Gaspee in Rhode Island and send the culprits to England for trial effected Adams' purpose—curiously, not in Rhode Island itself, but in Virginia, where the House of Burgesses, on 12 March 1773, appointed a committee of 11 to communicate with other colonies on the doings of the administration, especially in Rhode Island, and report. The plans were characteristically different, the Massachusetts being by the town voters, the Virginia by the legislature, but the latter was immediately effective in eliciting response. Committees were appointed by Rhode

Island 7 May, Connecticut 21 May, New Hampshire 27 May, Massachusetts 28 May, South Carolina 8 July. This threat of united opposition daunted the government; the Gaspee prosecutions were not pressed, and the commission found adversely to its commander. There being nothing more to do, the legislative committees stopped for the time, after exchanging proceedings. The Boston committee alone continued its political activities, and the tea question (see BOSTON TEA-PARTY) soon revived the others. The Boston committee, followed by that of Connecticut, sent out circulars urging the defeat of British purposes; and the former, by legal town-meeting, was made the executive of Boston. It called the committees of five surrounding towns into consultation, and sat "like a little Senate," Hutchinson said. Under its direction the tea was thrown into the harbor. The Tea Act roused the remaining colonies: Georgia in September, Maryland and Delaware in October, North Carolina in December, New York and New Jersey in February, chose legislative committees of correspondence; and new municipalities joined the movement—several in New Hampshire and Rhode Island and the city of New York. After the Boston Port Bill came into effect the Boston committee invited those of eight other towns to meet in Faneuil Hall, and the meeting sent circulars to the other colonies recommending suspension of trade with Great Britain, while the legislative committee was directed by the House to send copies of the Port Bill to other colonies, and call attention to it as an attempt to suppress American liberty. The organization of the committees was at once enormously extended; almost every town, city, or county had one, though a few dismissed theirs in fear of the coming storm. The Boston opposition attempted this, but were crushingly defeated. In the middle and southern colonies the committees were empowered, by the terms of their appointment, to elect deputies to meet with those of other committees, to consult on measures for the public good. The history of the committees from this time on is the history of the preliminaries of the Revolution. Consult Frothingham, 'Rise of the Republic' (1872).

Committees of Safety, in American history, these were a later outcome of the committees of correspondence (q.v.). In Massachusetts, as affairs drew toward a crisis, it became usual for towns to appoint three committees of correspondence, of inspection, and of safety. The first was to keep the community informed of dangers either legislative or executive, and concert measures of public good; the second to watch for violations of non-importation agreements, or attempts of loyalists to evade them; the third to act as general executive while the legal authority was in abeyance. In February 1776 these were regularly legalized by the General Court; but consolidated into one, called the "Committee of Correspondence, Inspection, and Safety," to be elected annually by the towns. This possessed all the powers of the other three, but in addition was empowered to notify the proper authorities of all violation of any of the acts, resolves, or recommendations of the legislature; also to send for persons and papers, call out the militia, take charge of confiscated property and prisoners of war, and carry out

COMMODORE — COMMON CARRIERS

the laws against Tories. An appeal lay from them to the legislature, but was not often thought judicious. Previous to this, however, in October 1774, the first Provincial Congress of Massachusetts had appointed a provincial committee of safety, with 11 members, to act as the general executive of the province; and in the next few weeks it made arrangements to raise and support an army. On 9 Feb. 1775 the second Provincial Congress constituted five members a permanent executive, and instructed it to "alarum, muster, and cause to be assembled with the utmost expedition, and completely armed, accoutred, and supplied, such and so many of the militia of the province as they shall judge necessary," such levy to be made when the committee thought a forcible attempt was to be made to carry out the Boston Port Bill. It was this committee's decision to take possession of Charlestown and Dorchester Heights, on the rumor that Gage was to have heavy reinforcements and occupy them, which led to the battle of Bunker Hill. New York had also a committee of safety, of 100 men, but it is characteristic of the undeveloped politics of the time that several of these were conservatives who afterward joined the British side. Partly from this, and partly from the unwieldy size of the committee, an inner committee was formed consisting entirely of Sons of Liberty, and directed its operations. At the news of the battle of Lexington, they called a public meeting in New York at the city hall, and secured the arms and ammunition in the arsenal. John Lamb and Isaac Sears led the action, arrested all British vessels about to sail for Boston, locked up the custom-house, and discharged the cargo of a vessel detained by British authorities as loaded with supplies for the patriots, formed a military company, armed it from the arsenal, surprised and captured the chief depot of British stores at Turtle Bay, and when the British commander ordered his men to join the army in Boston, refused to allow them to take any arms but those in their hands. Otherwise they were to be allowed to embark unmolested. The more ardent members were displeased at this, but kept the letter of the promise and no more. The muskets being carried in wagons, they confiscated them as not "in the hands," the soldiers declaring that they should not be used against their brethren in Boston. Consult the functions of the committees, Sparks, 'Life of Gouverneur Morris,' Vol. I., chap. 2.

Commodore, in the United States navy, formerly an officer ranking next above a captain, and commanding a few ships when they were detached for any purpose from the rest of the fleet. The grade was abolished by Congress in 1899, when all commodores became rear-admirals.

The word is also a title given in courtesy to the president of a yachting club, or to the senior captain of a line of merchant vessels.

Commodus, kōm mō-dūs, **Lucius Aelius Aurelius**, Roman emperor: b. 161 A.D.; d. 31 Dec. 192. He was the son of Marcus Aurelius and gave early proofs of his cruel and voluptuous character. On the death of Marcus Aurelius, 180 A.D., Commodus ascended the throne, and showed himself a more execrable monster than even Caligula, Nero, or Domitian. For his amusement he cut asunder persons

whom he met, put out their eyes, mutilated their noses, ears, etc. He was endowed with extraordinary strength, and often appeared in imitation of Hercules, dressed in a lion's skin, and armed with a club. To fill the treasury, exhausted by his extravagances, he imposed unusual taxes upon the people, sold governments and offices to the highest bidder, and pardoned criminals for money. To display his strength and skill in arms he appeared publicly in the amphitheatre. He is said to have fought in this way 735 times, and as his opponents were armed with weapons of tin or lead, while he was encased in impenetrable armor, he had naturally an easy victory on every occasion. In his combats with wild beasts he was securely protected by a screen of network, through which he hurled his darts or shot his arrows. A part of the city having been consumed by fire, and the people reduced to despair by famine, disturbances broke out, and the emperor was obliged to consent to the death of his minister, Cleander, who was charged with being the author of these calamities. Commodus was strangled by the gladiator Narcissus, and on the news of his death, which was reported to be the consequence of an apoplexy, the senate declared him an enemy of the state, ordered his statues to be broken to pieces, and his name to be erased from all public inscriptions. Rome was indebted to him for her handsomest baths — the *Thermæ Antoninianæ*. He established also an African fleet, in addition to the Egyptian one, for the purpose of supplying the city with corn.

Common, that which belongs as a privilege or right equally to more than one, to many, or to the public at large; free to all; general; universal; public; having no separate owner; as, the common weal.

In logic the word is applied to terms or names, in opposition to individual, singular, or proper. "Common terms, therefore, are called 'predicables' (namely, affirmatively predicable), from their capability of being affirmed of others; a singular term, on the contrary, may be the subject of a proposition, but never the predicate unless it be of a negative proposition (as for example, the first-born of Isaac was not Jacob); or, unless the subject and predicate be only two expressions for the same individual object, as in some of the above instances."

The word is also applied to an open and (generally) unenclosed space, the use of which is not restricted to any individual, but is free to the public or to a certain number. In most of the cities and towns in the United States there are considerable tracts of land appropriated to public use. These commons were generally laid out with the cities or towns where they are found, either by the original proprietors or by the early inhabitants.

Common Carriers, such as carry goods for hire indifferently for all persons. The term includes carriers by land and by water. On the one hand they comprise stage-coach proprietors, railway companies, truckmen, wagoners and teamsters, carmen, porters, and express companies, whether such persons undertake to convey goods from one portion of the same city to another, or through the whole extent of the country, or even from one country to another; and on the other hand they include the owners and masters of every kind of vessel or water-

COMMON COUNCIL — COMMON-TIME

craft, who undertake to carry freight of any kind for all who choose to employ them, whether the extent of their navigation be from one continent to another or only in the coasting trade, or whether employed in lading or unlading goods or in ferrying, with whatever motive power they may adopt. (Story, Bailments, §§484-496.) Common carriers are liable for all damage or loss during the transportation from any cause, except the act of God or the public enemy. Common carriers both by land or water, when they undertake the general business of carrying every kind of goods, are obliged to carry all which offer, and if they refuse without just excuse, they are liable to an action. Common carriers may qualify their common-law responsibility by special contract. The bill of lading is usually the written evidence of the contract between the parties. The responsibility of the carrier begins on receipt of the goods from the owner. Carriers of passengers are not held responsible as insurers of the safety of those whom they transport, as common carriers of goods are. They are, however, bound to a high degree of care in the selection of appliances, employees, etc., in order to secure the safety of their passengers. See **COMMERCE, INTERSTATE**.

Common Council, the council of a city or corporate town, empowered to make by-laws for the government of the citizens. In American cities the city council is generally composed of two branches, called, respectively, select and common. They are elected by the people.

Common Law in America. See **LAW, COMMON, IN AMERICA**.

Common Life, Brethren of the, or The Common Lot, a religious institute founded about 1376 by Geert or Gerhart Groot at Deventer, in the Low Countries. Groot on a visit to the noted mystic Ruysbroek was so impressed by the spectacle of peace and joyful co-operation shown in the community of Austin friars over which Ruysbroek presided that he resolved to form a society embracing both clerics and laymen who, without taking the monastic vows, should lead an austere Christian life in common. One of the aims of the brotherhood was to conduct schools for the religious and moral education of children, and their labors in that field were so successful and so highly appreciated that their school at Hertogenbosch had 1,200 pupils and another school even a larger number. Establishments of the brotherhood were founded in Italy, Sicily, and Portugal, and in 1430 there were in existence 130 societies of the institute. At the same time there was formed a similar institute for women: here the superior of each society was styled the Martha. Among the eminent characters who were members of the brotherhood or alumni of their schools were Thomas à Kempis, Nicolaus Cusanus and Erasmus. Many of the "obscurantist" letters in the 'Epistolæ Obscurorum Virorum' purported to be written by members of the Deventer Brotherhood, who are made to appear as irredeemable blockheads.

Common Pleas, Court of. See **COURT**.

Common Prayer, Book of, the book which contains the public form of prayer prescribed by the Church of England to be used in all churches and chapels, and which the clergy are to use under a certain penalty. The Book of Common Prayer is used also by the English

speaking Episcopal Churches in Scotland, Ireland, America, and the colonies, as well as by some non-Episcopal bodies, with or without certain alterations. It dates from the reign of Edward VI.; was published in 1549, and again with some changes in 1552. Some slight alterations were made in it when it was adopted in the reign of Elizabeth. In the reign of James I., and finally soon after the Restoration, it was revised.

Common Schools, schools for the common people or the people in general; in the United States the term means schools to which all persons within certain ages, except criminals and those with contagious diseases, may attend. The common schools in nearly all the States and Territories are supported by public funds. At first the term was confined to elementary and secondary schools, but there is a growing tendency to include in the common schools of the United States all grades and degrees from the kindergarten to the university. At present (1903) laws relating to compulsory education have been enacted by 31 States, one Territory, and the District of Columbia. There are enrolled in the elementary and secondary common schools 17,299,230 persons or over 22 per cent of those of school age, namely, between the ages of 5 and 21 years. There are about 420,000 teachers employed in about 300,000 school houses. The common school system in general use in the United States is now being extended into Porto Rico, Hawaii, and the Philippine Islands. Cuba has adopted the same system. See **EDUCATION IN THE UNITED STATES; EDUCATION, ELEMENTARY, SECONDARY**, etc.

Common Sense, the philosophy of the so-called Scotch school of philosophy founded by Thomas Reid (1710-96), who aimed to establish a series of fundamental truths indisputable as primitive facts of consciousness. He taught that the general consent of mankind as to the existence of an external world, as to the difference between substance and qualities, between thought and the mind that thinks, is sufficient to establish the reality of a permanent world apart from ourselves; and he maintains that sensations are not the objects of our perception, but signs which introduce us to the knowledge of real objects.

The name is applied in colloquial language to that power of mind which arrives at correct conclusions, even if the thinker has no knowledge of laws of thought.

Common-time, time with two beats in a bar or any multiple of two beats in a bar. The beats may be of the value of any note or rest or compound of notes and rests, providing the sum required by the time sign be exactly contained in each bar. Common-time is of two kinds, simple and compound. Simple common-time is that which includes four beats in a bar, or any division of that number, or square of the number of its divisions. The signs used to express simple common-time are the following: $\frac{2}{1}$, $\frac{2}{2}$, $\frac{2}{4}$, $\frac{4}{4}$, $\frac{4}{8}$, and the characters C and \mathcal{C} . In these signs the upper figure denotes the quantity of notes required in the bar, and the lower figure the quality of the notes. Compound common-time is expressed by the signs $\frac{6}{4}$, $\frac{6}{8}$, $\frac{12}{8}$, such signs meaning two or four beats of three crotchets or quavers to each beat.

COMMONS — COMMUNICATIO

Commons, John Rogers, American economist: b. Darke County, Ohio, 13 Oct. 1862. He graduated at Oberlin College 1888, studied at Johns Hopkins University 1888-90, and became professor of sociology in Syracuse University, resigning in 1899 to become director of the Bureau of Economic Research. He is the author of many articles on wealth, social reform, representation, municipal government, etc., which have appeared in the leading American journals devoted to those subjects, and of 'Social Reform and the Church,' 'Proportional Representation,' 'The Distribution of Wealth,' etc.

Commons. The commons of Great Britain, in a general sense, consist of all such men in the kingdom as have not seats in the House of Lords, and every one of whom has a voice in Parliament, either personally or by his representatives. Commons in Parliament are the lower house, consisting of representatives elected by the counties or divisions of counties, and by the cities and boroughs. In the election of representatives anciently all the people had votes; but in the 8th and 10th of King Henry VI., for avoiding tumults, it was enacted that in counties none should vote but such as were freeholders, did reside in the county, and had 40s yearly revenue, equivalent to nearly £20 a year of the present money; the persons elected for counties to be *militēs notabiles*, at least esquires or gentlemen fit for knighthood; native Englishmen, or at least naturalized, and 21 years of age; no judge, sheriff, or ecclesiastical person to sit in the House for county, city, or borough. The House of Commons, in Fortescue's time, who wrote during the reign of Henry VI., consisted of upward of 300 members: in Sir Edward Coke's time their number amounted to 493. At the time of the union with Scotland, in 1707, there were 513 members for England and Wales, to which 45 representatives for Scotland were added; so that the whole number of members amounted to 558. In consequence of the union with Ireland, in 1801, 100 members were added for that country; and the whole House of Commons therefore consisted of 658 members. By the reform bill of 1832 the number of members was altered as follows: 500 for England and Wales, 53 for Scotland, and 105 for Ireland. The reform acts of 1867 and 1868 introduced a further alteration, the numbers being 493 for England and Wales, 60 for Scotland, and 105 for Ireland; by the act of 1885 they became respectively 495, 72 and 103. See PARLIAMENT.

Commonwealth, the state or prosperity of a country without any reference to the form of government under which it may be at the time. Owing to the semi-independent position of the States of the American Union the term commonwealth is of frequent application to the various members of the great Federal government, which itself is spoken of as the National or Federal Commonwealth in contradistinction from its constituent autonomies. In many of the States the legal proceedings against criminals, etc., are instituted in the name of the (for example) "Commonwealth of — v. John Doe."

The word is also applied to the period in the history of England during which the parliamentary army and the Protector Oliver Crom-

well exercised the power of government. King Charles I. was beheaded on 30 Jan. 1649; but if the beginning of the commonwealth be deferred to the time when Oliver Cromwell became Protector, then its beginning was not till 16 Dec. 1653. It received an all but fatal blow by the death of its great chief, 3 Sept. 1658. On 22 April 1659, Richard Cromwell, his incompetent son and successor, resigned, and on 29 May 1660, Charles II. was restored to the throne.

Communalism, *kōm'mū-nał-izm*, the theory of government by communes or corporations of towns and districts, adopted by the advanced republicans of France and elsewhere. The doctrine is that every commune, or at least every important city commune, as Paris, Marseilles, Lyons, etc., should be a kind of independent state in itself, and France merely a federation of such states. This system must not be confounded with "Communism" (q.v.), with which, however, it is naturally and historically allied, though the two are perfectly distinct in principle.

Commune, *kōm'mūn*, the unit or lowest division in the administration of France, corresponding in the rural districts to the English parish or township, and in towns to the English municipality. In France there are about 36,000 communes, with a considerable measure of self-government, with the power of holding property, etc. Each commune has a council elected by universal suffrage, and the council is presided over by a *maire* and one or more *adjoints* or assistants. In the larger communes the *maire* is selected by the central government out of the members of the council; in others he is appointed by the prefect of the department. The central government, through its officials, exercises generally a very large control over the affairs of the commune.

The rising of the Commune of Paris in 1871 should not be confounded with "communism" (q.v.). It was a revolutionary assertion of the autonomy of Paris; that is, of the right of self-government through its commune or municipality. The theory of the rising was that every commune should have a real autonomy, the central government being merely a federation of communes. The movement was based on discontent at Paris, where the people found themselves in possession of arms after the siege of the Germans. The rising began on 18 March 1871, and was only suppressed 10 weeks later after long and bloody fighting between the forces of the commune and a large army of the central government; 6,500 Communists having fallen during 20-30 May, and 38,578 being taken prisoners.

Communicatio, *kōm-mū-nē-kā'shī-c*, or **Communio**, **Idiomatum**, *īd-ī-ō-mā'tūm*, a term or phrase hardly capable of translation into English, which is used to signify the appropriation mutually of divine attributes to Christ as man, and of human attributes or human affections to Christ as God: this because of the hypostatic union of the divine nature and the human nature in Christ: thus, we say "God died for us," and the mother of Jesus is *theotokos*, *deipara*, mother of God. *Idioma*, plur. *idiomata*, is Greek equivalent to Latin *proprietās*, and means that which belongs to one, an attribute: the theological phrase in Greek is *antidosis idiomaton*.

COMMUNION--COMMUNISM

Communion, the reception of the Eucharist. In the Roman Catholic Church the Eucharist is administered to the faithful only in one kind, the species of bread: only the priest who performs the act of consecration receives the sacrament in both kinds: in the Protestant churches the laity receive the sacrament in both kinds, and the usage of the Greek and Oriental churches is the same. The withholding of the cup from the laity was not required by the laws of the Latin Church till the Council of Constance ordered it in 1414, though by that time usage had made it an almost universal custom. Yet down to the 11th century communion under both species was universal, and as late as the middle of the 13th century St. Thomas Aquinas notes the communion under one kind as the usage only of "some churches." As it is purely a Church regulation, the Church can and does dispense from it, or the Church can abrogate it and bring back the original usage of communion in both kinds. Even in the earliest times communion under one kind was the rule when the sacrament was to be administered to the sick and infirm in their homes: in that case the one kind was under the species of bread; but in the same early period it was customary to administer the Eucharist to infants immediately after baptism, but only under the one species of wine.

Communism. Although aiming at the abolition of private property, communism must not be understood as including at all times an equal division of all property. In its limited application it may mean the common management of industry and the sharing of the fruits of some of these in common. Socialism is not communism, though some socialistic schools are communistic, that of Edward Bellamy's 'Looking Backward' being purely so.

Communism, or the sharing of things in common, is, in a limited form, practised by every civilized community. There is to-day common management of parks, schools, and other utilities, and practical communism in water, which is supplied free to the poorest inhabitant of our cities. In the case of commodities which are plentiful and cheap, as, for example, matches, there is a kind of communism prevailing among individuals. But perfect communism as a social theory finds few adherents, and practical experiments in the past in such directions have been, save for limited periods, unsuccessful. Even where the communism of certain societies or settlements has succeeded temporarily it has done so largely by their trading with or manufacturing for the greater world of capital and labor that touches them from without. Few of such communities that have remained entirely isolated have attained even a measurable degree of success.

It is not too much to say that in primitive times property was in common, and that individual ownership arose as a natural development out of communism. The Cretans and the Spartans possessed communistic societies, and there seems to be little doubt that communism as a supernatural ideal was practised among the early Christians. That it was successful for a time in the primitive state of society then prevailing among the disciples of Jesus also seems highly probable. The communistic societies that have since been formed have been successful in the measure of

religious devotion that inspired sacrifice, and have declined as this religious ardor subsided, or became corrupted by other elements. But whatever their temporary success may have been among the early Christians, the experiments were soon utterly abandoned, and the principle of individual ownership of property finally and fully asserted itself. That even the early Christians adopted without qualification the theory of communism may be doubted. Certainly authorities are disagreed, so that even here we are without the necessary data to conclude that perfect communism was temporarily successful. During the Middle Ages many of the religious orders, notably those that strove to preserve the apostolic simplicity of the early Church, the Franciscans, the Brothers of the Common Lot, and others, taught and practised communism.

The communities that have been formed in the United States, mostly in New England and the West, have nearly all died out, or exist in a moribund condition. We need not speculate upon the reasons, though it would seem that the desire of individual ownership, with the incentive to action which such ownership inspires, is indestructible and therefore fatal to perfect communism. The most famous of all American communistic or semi-communistic societies that arose as a result of the teachings of Charles Fourier (q.v.), was that of Brook Farm (q.v.) because of the intellectual and literary eminence of its founders. Horace Greeley (q.v.) was a warm friend of the Fourierite movement from the first, advocated it powerfully in the *New York Tribune*, and was vice-president of the North American Phalanx, in Monmouth County, N. J., one of the most successful of the Fourierite communities, for it lasted over 12 years, dying in 1856. It was intended as the model of its kind, and at the beginning it prospered. Perhaps no similar movement has ever received anything like the influential support accorded to Fourierism. The teachings of this remarkable man, the insight and value of much that he wrote, as well as the warmth that suffused his prophecies, enlisted the enthusiasm and aid of some of the most eminent men of the time. But feuds and inharmony set in, and slowly the movement began to disintegrate. The noble dreams of Fourierism were either founded upon mistaken generalizations, or were too early anticipations of the industrial and social development of mankind. It was only at a late period of its career that Brook Farm came to be modeled on the Fourier plan, and its simple life became perhaps too systematized. Work was in common, and at the most menial occupations men who became the glory of American letters, and women of the highest New England culture cheerfully took their turns. But with the ebbing of the tide of Fourierism the Brook Farm experiment came to an end. The North American Phalanx outlived it for a short period, but with the death of that settlement a movement which embodied one of the most pretentious and sweeping philosophies of social regeneration perished from the American continent. Fourierism, which in France had died for lack of funds, had received in America as fair and adequate a trial as was ever accorded to any mooted social reform. For years its disciples had taught and experimented, only to end with failure. When

COMMUNISTIC SOCIETIES — COMMUTATOR

The New York *Tribune* abandoned its advocacy it ceased even to be a topic of general discussion, and in 1856 came its final collapse.

In connection with early attempts in the last century to found communistic settlements in this country the name of Robert Owen (q.v.) is conspicuous. This English manufacturer, an enthusiastic communist, having seen his efforts in Great Britain fail of fruition, visited this country and founded a number of communities, the best known of which was that of New Harmony, Ind. Most of the others were short-lived, and that of New Harmony, born in 1825, expired in 1827. Among the communities that owe their origin to religious fervor, and which still survive at Mount Lebanon, N. Y., Union Village, Ohio, Watervliet, N. Y., and elsewhere are those of the Shakers (q.v.). Their founder, Ann Lee (q.v.), landed in New York in 1774, with eight followers from England. They had fled to escape the persecution which had followed her bold assertion of divine revelation. The Shakers are celibates, and thus their communities have not grown very rapidly, yet 15 are said to exist to-day. The Oneida Community, another of the very few survivals of that communistic spirit which swept over the country in the middle forties, was established in 1848. It ignored the regulation of marriage, founding the union of the sexes purely on the mutual consent of the man and woman. It was because of this that the Oneida Community fell into evil repute, and this reputation extended in many cases to communities less deserving of the stigma. The union of one man with one woman the community expressly discouraged as an "exclusive and idolatrous attachment." When a man and woman were brought together, and showed a tendency to "fall in love," everything was done by the society to discourage such relationship, even to the extent of forcing them apart by publicly expressed condemnation. A more extraordinary view of sex relationship has probably never suggested itself among all the confused and eccentric beliefs of mankind. The Oneida Community was founded by John Humphrey Noyes, in Madison County, N. Y. They practised communism, and a change of occupation (a Fourierite principle). They have, it is said, forbidden the admission of new members.

The Harmony Society, which was succeeded in 1825 by New Harmony, Robert Owen having purchased the land of that settlement from George Rapp (q.v.) and his followers, was a notable experiment. Rapp's notions were queer enough, but he had great influence with his followers, who regarded him as possessed of supernatural powers. They practised communism and celibacy from 1805, the date of the founding of the community in Butler County, Pa., where they remained until 1814, when they changed their location to the Wabash valley. Here the settlement flourished until the purchase of the lands by Robert Owen. The Amana Community, still surviving, was formed in 1842 by emigrants from Germany and Switzerland, who originally belonged to the peasant class. They settled in New York State, near Buffalo, and later removed to Iowa. They were spiritualists who regarded themselves as the subjects of special revelation. This religio-communistic settlement is probably the earliest in origin in this country, for it traces the beginnings of its

creed as far back as the early part of the 18th century. Their rules of life are rigid and forbidding; amusements are prohibited; and much that ministers to innocent pleasure is banished as sinful.

To mention even the names of all the communities that exist or have existed in the United States would take more space than can be given to the subject. The appended bibliography will guide to all the information of which the reader may be in search. But special mention ought not to be omitted of the Icarian Community, remarkable as owing its origin to a book, 'A Voyage to Icaria,' by Etienne Cabot (born 1788), who had been a member of the French legislature and a leader of the Carbonari. He sailed in 1848 with a number of his followers from France, and established the community in Illinois in accordance with the ideas contained in his work. They numbered as many as 1,500 at one time. Later they were compelled to seek other settlement in Iowa. This community was peculiar in that it came nearer to the ideal of democratic communism; the rigid regulations of other communities were absent, the point aimed at being to let every one do as he pleased. A settlement in which no community of property save that of land obtains, and in which the government is nearly as purely democratic, is that of Fairhope, Ala., founded a few years ago by a handful of the disciples of Henry George. It is organized as a corporation, by which its real estate is administered. The annual value of the land is taken for communal purposes. It numbers about 300 members, and up to the present time is prosperous.

All these experiments which have been reviewed have failed to demonstrate the feasibility of communal life. Existence within its confines is, for the most part, meagre and unsatisfying. Though these communities sometimes grow rich, progress in its finer sense there is none; they do not rise in culture and intelligence above their original level. Yet some things they have demonstrated, among which are the possibilities of a more peaceful industry, more unselfish lives, together with a fuller leisure, and freedom from the harassing fear of want. Abnormal as they seem, they are really protests against what in our civilization is abnormal. Clothed, as the most successful of them are, in religious guise, the fact that they are impulses, even when most eccentric, of the more profound and imperishable nature of man, is vastly significant.

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JOSEPH DANA MILLER.

Communistic Societies. See COMMUNISM.

Community of Interest. See RAILROADS.

Com'mutator, a piece of apparatus used in connection with many electrical instruments for reversing the current from the battery. There are various forms, which will generally be found described with their proper instruments. See DYNAMO.

COMNENI — COMONFORT

Comneni, kŏm-nē'nī, an extinct family of sovereigns, according to an unsupported tradition, of Italian origin, which numbered, on the throne of Constantinople (1057 to 1204) and on that of Trebizond (from 1204 to 1461), 18 emperors, besides 19 kings and numerous independent princes. When the Crusaders had overturned the throne of the Comneni in Constantinople, and established the Latin empire there in 1204, a prince of the ancient house of the Comneni founded an independent state at Trebizond in Asia Minor, where he was governor. The last sovereign of this house was David Comnenus. From him, it is said, was descended Demetrius Comnenus, a French captain of dragoons, who died without children at Paris in 1821, with the title of *maréchal de camp*. But his descent cannot be historically traced. Ducange asserts without hesitation that Mohammed II., the conqueror of Constantinople, after he had obtained the empire of Trebizond, so called (which was scarcely as large as a French department), from the Emperor David, by a treaty, sent for this prince and his seven children to Constantinople. In order to get possession of the income which had been secured to the Greek prince he ordered him to be put to death, with all his children, at Adrianople in 1462, under pretence of a conspiracy. This is confirmed, according to Ducange, by all contemporary writers — Chalcondylas, Ducas, Phranzes. A remarkable member of the family was the Princess Anna Comnena, daughter of the Emperor Alexius I., who flourished in the first half of the 12th century.

Como, kŏ'mō (anciently COMUM), Italy, capital of the province of Como, in Lombardy, 24 miles northwest of Milan in a delightful valley at the foot of Lake Como. It is a bishop's see. The city contains some antiquities, a splendid marble cathedral dating from the 14th century, and 12 beautiful churches; also a cabinet of natural history and natural philosophy. During the 11th and 12th centuries Como was at the head of the Ghibelline party, and the rival of Milan. Here was born Pliny the Younger and Volta and Giovio, writers, also the popes Clement XIII. and Innocent XI. A number of the inhabitants travel about with small-wares, such as mirrors, spectacles, little pictures. Even in the time of the Roman emperors this taste for emigration manifested itself. The inhabitants of Como were then to be found in all parts of Italy in the capacity of masons. Silk and knit wear are manufactured. The province of Como has an area of 1,049 square miles and a population of 515,134. It has fine pastures, and yields grain, olives, wine, and silk. Population of the commune 25,800.

Como, Lake (LAGO DI COMO, lä' gō dē kŏ'mo, anciently LAC LACUS LARIUS), a lake in the north of Italy, at the foot of the Alps. Toward the middle it is divided into two branches by the point on which is situated Bellagio. The branch extending toward the southwest to the city of Como goes under the same name; that which turns to the southeast to Lecco takes the name of Lake Lecco. The length of the lake to Bellagio is 16 miles, that of the southwest branch 19 miles, and that of the southeast branch 12½ miles. The greatest width is two and a half miles. More than 60 rivers and rivulets flow into it, and the Adda passes through it. It is

about 700 feet above the level of the sea, and about 190 feet above Milan. Lake Como, the most delightful of all the lakes in Upper Italy, is surrounded by mountains 3,000 or 4,000, or even 7,000, feet high, which descend toward the lake, and in many parts are clothed with woods. It is bordered by delightful gardens and country seats. Fish, particularly trout, are caught in the lake. The neighboring country is rich in minerals — iron, copper, and lead.

Como Stage, a thin mass of shales and sandstones representing clays and sands deposited in a fresh-water lake that covered southern Wyoming and extended into Colorado. The exact age of the beds is still in dispute; they have been assigned to the top of the Jurassic, though there are good reasons for placing them at the base of the Cretaceous. The beds are remarkably rich in fossils of land reptiles and mammals, including such giant saurians as *Atlantosaurus*, and are typically developed near Como, Wyo. See CRETACEOUS SERIES; JURASSIC SERIES.

Comonfort, Ygnacio, ĩg-nä'sē-o kŏ-mŏn-fŏrt', Mexican general: b. Pueblo 12 March 1812; d. 13 Nov. 1863. He became a captain of cavalry in 1832, in 1834 was made prefect and military governor of the district of Tlapa, and in 1842 he was elected member of the National Congress. This Congress was soon dissolved, and Comonfort resumed his functions in Tlapa, displaying great energy in repelling the aggressions of hostile Indians. Appointed 3d alcalde of the capital, and afterward prefect of western Mexico, he relinquished these positions to engage in the war with the United States; and on Santa Anna's dissolving the army and leaving the capital open for the Americans, Comonfort commenced organizing guerrillas, when he was summoned to the Congress of Queretaro, where a treaty of peace was concluded with the United States. He was now chosen senator by his native state, and served in this capacity until 1851. In 1852-3 he was the representative in Congress of the newly created state of Guerrero, and acted as custom-house director of Acapulco and other places until Santa Anna's return to power, when he was dismissed from office. He now joined Alvarez, raised the standard of rebellion, proclaimed the plan of Ayutla, 11 March 1854, and compelled Santa Anna, who endeavored to seize that town, to retreat. At the end of the campaign in 1855, Santa Anna was finally compelled to abdicate. Alvarez assumed the supreme government, but shortly afterward delegated his authority to Comonfort, who became provisional president of Mexico, 11 Dec. 1855. He soon met, however, with the most strenuous opposition on the part of the clergy, the army, and the large body of the Conservative party. The junta of Zacapoastla declared itself on 19 December against the president, and a little later the seat of revolution was transferred to the city of Puebla. Over 5,000 men assembled there in February 1856. Comonfort marched against them, forced the rebels to surrender on 20 March, promulgated on 31 March a decree ordering the confiscation of the property of the Church, followed on 28 June by another decree forbidding the clergy to hold landed estate. At the same time he sent a Mexican envoy to Rome to settle with the holy see the questions raised by these measures; but the Mexican clergy made

COMORIN — COMPANY

all possible effort to prevent his reception, while at home they labored to undermine the government. Congress, which was opened by the president, 5 Feb. 1857, assembled under very inauspicious circumstances. It proceeded, however, to draw up a new constitution, which vested the legislative power and the control over religious and military affairs exclusively in Congress. The president, finding it impossible to meet the difficulties which agitated the country under such restrictions, was eventually constrained, on October 1857, to apply for extraordinary powers. These were granted by Congress on 4 November and he was proclaimed constitutional president on 1 December. His position, however, became more and more critical. Opposed by the clergy and the army, he found himself isolated, and could only depend upon the brigade of Gen. Zuloaga, which was attached to him personally. By a pronunciamiento at Tacubaya, 17 December, this brigade, too, declared itself against the new constitution, but appointed Comonfort chief of a new government. By a new pronunciamiento, however, of 11 Jan. 1858, they discarded him altogether, and the insurrection which broke out on that day in the capital led to a fierce struggle of several days. Appointing Juarez, president of the supreme court, provisional president, Comonfort attempted to regain his authority by force of arms, but in vain. On the morning of 21 January the capital was in the hands of the rebels. The House of Representatives, convoked on the same day by Zuloaga, appointed that general provisional president, while Juarez convened a congress at Guanajuato, to guard the rights of Comonfort. The latter in the meantime, deserted by his soldiers, and unable any longer to maintain his power, repaired to the United States. He returned in 1862 and was minister of war in the Juarez cabinet.

Comorin. See CAPE COMORIN.

Com'oro Islands, a volcanic group in the Indian Ocean, between the northern extremity of Madagascar and the continent of Africa. They are four in number — Angareja (called also *Comoro*), Mohilla, Johanna, and Mayotta. In 1843 France took possession of the last-mentioned island, and the others were taken under the protection of the same country, by treaty, in 1886. They are extremely fertile, well stocked with cattle, sheep, hogs, and birds of various kinds. They produce, likewise, sweet and sour oranges, citrons, bananas, honey, sugar-canes, rice, ginger, coconuts, etc. The people are chiefly engaged in rearing cattle, and in the manufacture of coarse cloths, jewelry, and small arms. They are professed Mohammedans, but fetish worship is customary. Pop, Arabs and negroes, 70,000.

Compagnie des Indes, *koñ-pan-yē dā zard* ("Company of the Indias"), an organization which owned Louisiana for several years. See MISSISSIPPI BUBBLE.

Company (Old Fr. *compagnie*, from Lat. *companire*, "mess," from *com-*, "with," and *panis*, "bread"), an association of individuals formed for some purpose of mutual advantage, especially for business purposes. The commercial use of the word which bulks most largely now has two separate uses: in general of a firm or corporation; and particularly of the silent members of a business house whose names do not appear in its style but are comprehended by

the affix "and Company." Historically the earliest occurrence of the term in connection with business enterprise dates in England back to the 14th century, when the Merchant Adventurers of England about 1359 began trade. English commerce and empire are equally indebted to the efforts of the companies formed in the early part of the 17th century. The Eastland Company, the Muscovy Company, and the Turkey Company carried English trade into eastern Europe. The East India Company won the major part of the Asiatic trade for England, and gained possession of India and administered that country until the middle of the 19th century. The Virginia Company and the Massachusetts Bay Company prepared the way for English colonization in America, but never flourished. The history of the Hudson Bay Company is another interesting episode because of the combination of territorial and trading grants which it long held and because it still enjoys trading privileges. England still employs the same method of opening up trade, and the North Borneo Company, the British East Africa Company, and the famous South Africa Company were formed between 1880 and 1890. Germany with her new imperial policy fosters the formation of such associations, and in 1884 the German East Africa Company was started, with the object of extending trade and colonization. The London City companies also are historically important as outgrowths of the mediæval guilds and because for many years membership in them was a necessary preliminary to political privilege of any sort; their authority was curtailed in 1725 and by the reform bills of the 19th century, but members of the companies are still the only electors for civic offices.

In modern commerce companies may be most conveniently divided into the simple firm or partnership, which is a mere mutual agreement, and the stock company, which, by reason of its complex character and quasi-public nature, comes under State control and has displaced to a great degree the simpler method. In the stock company, instead of a private agreement, the members, under State authorization, make a company with a fixed capitalization divided into a certain number of shares, possession of which carries the right to vote, proportionally to holdings, on matters of business policy. State regulations require in all cases that one of the contracting parties be a resident of the State in which the company is incorporated, and that an office of the concern be located in the State. Other requirements vary in different States, especially in the matter of fees, which some of the western States have reduced to a minimum for the sake of attracting business to the State, and replenishing its treasury; and in the breadth and range of powers granted by the charter. The corporation laws of the State of New Jersey, together with its convenient situation near New York, have drawn a tremendous volume of this business to it. See CORPORATIONS; TRUSTS.

A particularly American class of stock company is the industrial, which is especially adapted to mine-exploiting or the development of agricultural business. In mode of government it differs from the usual share-holder controlled company, as it is largely managed by a promoter. The capitalization of American industrial com-

COMPARISON — COMPASS

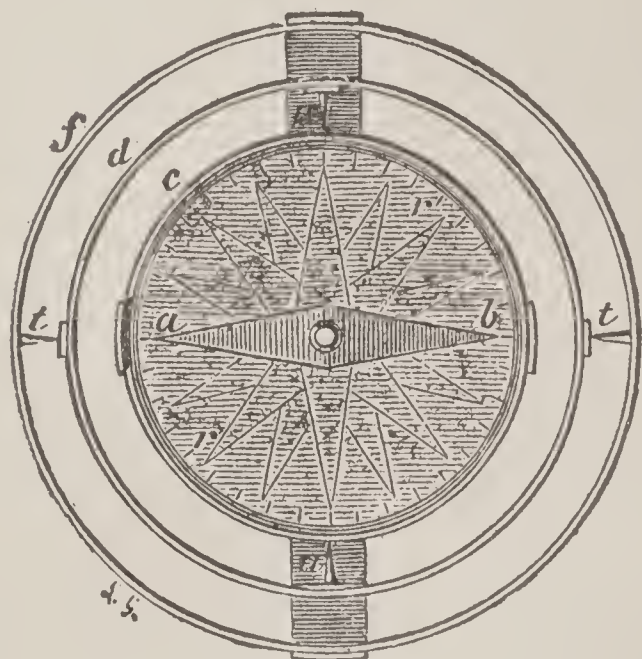
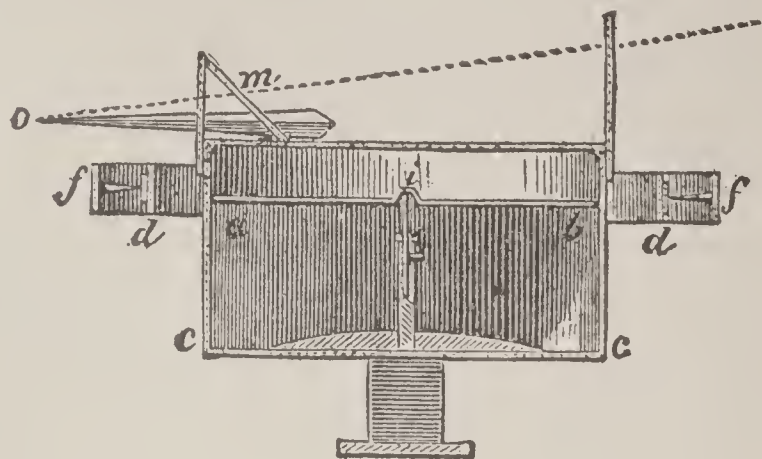
panies in 1903 is estimated at \$150,000,000,000, of which a large fraction is paid in in cash.

In military nomenclature a company is regularly an integral part of a regiment or battalion and consists of 100 men. A looser and typically American use of the word applies it to any small body of soldiers or uniformed men, especially as independent of a State or national soldiery. These independent companies, numbering something like 25,000 in the United States, form a valuable supplement to army and State militia, as was evidenced by their service in the Spanish war.

Compar'ison, Degrees of, in grammar, inflexions of adjectives denoting the degree in which a quality is possessed by a substance, either generally or in reference to other substances. The positive can scarcely be considered as a degree, as it denotes the quality generally without comparison. The comparative compares two things only, the superlative compares one thing with any number of others. In English the comparative is generally formed by the addition of *er*, the superlative by the addition of *est*, to the positive or monosyllabic adjectives and dissyllabic adjectives ending in *y*, or by the use of the words *more* and *most*, *less* and *least*, when the adjective is of more than one syllable and does not end in *y*. Adverbs are nearly always compared by the latter method. There are some adjectives, such as *good*, *better*, *best*; *little*, *less*, *least*, that do not form their degrees of comparison in the regular manner.

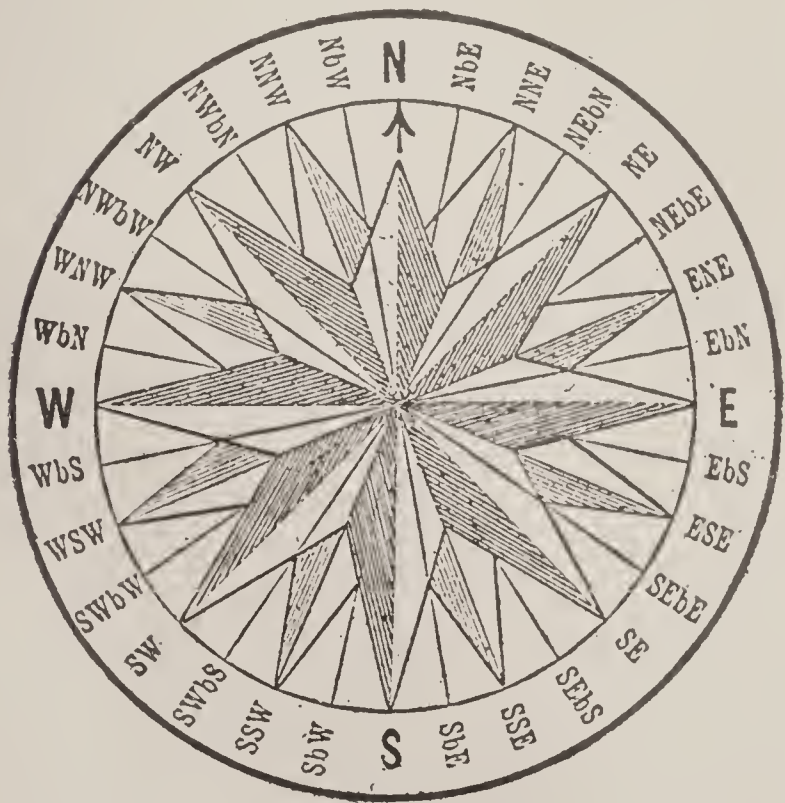
Compass, Mariner's, a form of compass specially adapted for use at sea. A thin circular sheet of mica is supported so as to turn with great freedom in a horizontal plane about its centre. This is called the compass-card. The bearing usually consists of a small plate of agate let into the card, and has a conical hole at the

probably still something to be learned on this question. The compass-card is marked with a star of 32 rays, which are called the rhumbs, or the points of the compass. A line joining two of these points diametrically opposite is or ought to be exactly parallel with the magnetic axis of the arrangement below; and at the extremities of these points are marked *n.* (north) and *s.* (south). *e.* (east) and *w.* (west) are marked at the extremities of another diametral line at right angles to the first. The other points have also names; and to repeat these from memory in order, beginning at north and going



Ship's Compass.

a b, Needle. *c c*, Box. *d d*, Inner gimbal. *f f*, Outer gimbal. *i*, Pivot upon which the card is placed. *m*, Reflector. *r r*, Card. *t t, u u*, Supporting pivots.



Compass Card.

centre, and this rests on a fine needle-point of hard steel. This arrangement gives very little friction. To the under surface of the compass-card a magnet is attached, or often in the best instruments several parallel magnets. Many experiments have been made to find the best arrangement for the magnets, but there is

round the whole circle, is what sailors call "boxing the compass."

The card is supported, as we have said, on a steel point, which is attached either to a hemispherical bowl of thick copper, or to a thick copper ring when the compass is to be used for night-sailing, in which case a lamp placed below the ring shines up through the mica card and makes the markings on it visible. This thick copper bowl or ring is called the compass-box. Its use is to damp the vibrations of the needle; for it is found that the presence of a large mass of copper properly placed damps the vibrations of a freely suspended magnet rapidly, while it does not at all prevent it from coming to rest in the proper position. The compass-box is suspended on gimbals, which are two concentric copper rings. The larger turns on a horizontal axis, whose extremities rest on the inside of the case that contains the compass. The smaller ring turns on a horizontal axis

COMPASS PLANT—COMPETITION

at right angles to the former, and resting on the outer ring. The compass-box is attached to the inner ring, and its weight tends to keep both horizontal. Thus supported, the compass-box and card always remain horizontal however the ship rolls or pitches. The chief difficulty in making use of the compass arises from the magnetism of the ship itself. In iron ships particularly, the magnetism of the ship greatly interferes with its indications. The effect of the ship's magnetism is determined by swinging the ship, and determining a correction to be applied for every position. This, however, is liable to some uncertainty, for it is found that rough weather and other circumstances alter the magnetism of the ship, and therefore its effect on the compass. It is usual to place a compass at the mast-head of large ships, and from time to time to compare the deck compass with it.

The origin of this instrument cannot be traced with anything like certainty. There is reason to believe that the Chinese knew something about the polaric property of loadstone more than 2,000 years before the Christian era. In the year 1242 A.D. Bailak Kibdjaki gave an explicit description of a primitive kind of compass in common use on the Syrian coast; and it is said that on the return of Marco Polo from Cathay, in 1260, he brought a knowledge of this as well as several other Chinese inventions with him. The Italians ascribe the invention of the compass to Flavio Gioja, a native of Amalfi, giving the dates 1300-20, but it is obvious from the dates given above that he can be credited only with some important improvement of the instrument. The discovery of the variation of the needle has been generally attributed to Columbus, but is now supposed to have been known much earlier.

Bibliography.—Cornwell, 'Compass Disturbance in Iron Ships'; Bowditch, 'The American Practical Navigator'; Capt. F. J. Evans and Archibald Smith, 'The Admiralty Manual for the Deviations of the Compass.'

Compass Plant (*Silphium laciniatum*), a tall composite yellow-flowered plant growing on the prairies of the Mississippi Valley, and remarkable from the fact that its erect radical leaves stand so that their edges point almost exactly north and south, especially in midsummer. This is said to be due to the action of light, and to depend on the leaves having an equal number of stomata on either face. The plant is known in some localities as "resinweed," because it contains such an amount of resinous matter. A European species of lettuce (*Lactuca scariola*) has received the same name.

Com'passes, a mathematical instrument used for describing circles, measuring lines, etc. They consist simply of two pointed legs movable on a point or pivot. For describing circles the lower end of one of the legs is removed and its place supplied by a holder for a pencil or pen. Hair compasses are compasses having a spring tending to keep the legs apart, and a finely threaded screw by which the spring can be compressed or relaxed with the utmost nicety, and the distance of the legs regulated to a hair's-breadth. Bow compasses are compasses having the two legs united by a bow passing through one of them, the distance between the legs being adjusted by means of a screw and nut. Propor-

tional compasses are compasses used for reducing or enlarging drawings, having the legs crossing so as to present a pair on each side of a common pivot. By means of a slit in the legs, and the movable pivot, the relative distances between the points at the respective ends may be adjusted at pleasure in the required proportion. Beam compasses are used where greater lengths are needed than can be secured by the ordinary pivot compasses. Points are arranged on a sliding bar so they can be clamped at certain distances from each other. Triangular compasses, having three legs, are used when it is desired to transfer the vertices of a triangle. Club compasses, called also bullet compasses, are constructed with a ball instead of one of the points of the ordinary compasses; the ball being arranged so as to turn in a hole or socket.

Compensa'tion, that which is given or received as an equivalent for services rendered, losses sustained, sufferings endured, or in payment of a debt; amends, remuneration, payment, recompense. When one is sued for a debt, it is competent for him, partially or wholly, to bar the claim by alleging that he is the plaintiff's creditor for services rendered or money lent. If the sum claimed from the plaintiff is found to be the exact equivalent of that for which he sues, the two are held to compensate or balance each other; if, on the contrary, it be less, it diminishes by so much the prosecutor's claim. If, however, the defendant feels that he owes the plaintiff more than that individual is indebted to him, he is required at the outset to pay into court the smaller sum for which he admits himself to be responsible.

Compensatio injuriarum is a defense against actions for damages claimed for slander, false accusations, and like causes.

Compensation Balance, a balance-wheel for a watch or chronometer, so constructed as to make isochronal (equal time) beats, notwithstanding changes of temperature. This effect is usually attained by having the balance-wheel cut into two segments, the arcs being fixed at one end each. This allows space for the expansion and contraction to counteract the varying strength of the spring. See CHRONOMETER.

Compensation Pendulum, a pendulum constructed of two different metals, as brass and iron, which so work against each other, that the expansion of the one downward is counteracted by that of the other upward. By this arrangement the pendulum does not vary in length, and consequently in frequency of vibration, whatever the temperature may be. Arnold's compensation balance-wheel for chronometers and watches is constructed on a similar principle.

Competition, a term nearly equivalent to the phrase "struggle for existence." Lamarck was the first to point out definitely the fact of competition in the cases of man and the sloth, but it was not until a half-century later that Darwin and Wallace emphasized its far-reaching importance as a biological agent in evolution. Competition may be most strikingly illustrated by a case in which it is entirely absent. The Great Salt Lake of Utah is inhabited by the brine shrimp (*Artemia fertilis*), which abounds in enormous numbers in the dense briny waters; hundreds may be dipped up in a dish of water and thousands captured by a few sweeps of the tow-net. As the water is so

COMPIÈGNE — COMPLETE ANGLER

salt that no other animal can live in it except a maggot near shore, it has absolutely not an enemy, and there is no other form to compete with it. Its food is a floating green alga (*Polycystis packardii*). It is absolutely harmless and without means of defense, and lays but few eggs; yet its success in point of numbers is beyond all precedent. Another case is that of a fly (*Ephydra gracilis*) whose larva abounds at the margin of the same lake. These two cases illustrate how a species may abound in profusion, though not crowding out other forms, since there are no competitions.

A familiar example of the crowding out of native species by those introduced from foreign countries in the struggle for existence among plants is the ox-eye daisy, which was introduced from Europe, first appearing in Leicester, Mass., in 1740. Many years ago what were once throughout New England green fields of grass became white with its flowers; it drove out even the grasses introduced. On the other hand, in central Europe, throughout France, the Pyrenees, and the Alps, as recently observed, it grows sparsely, never in extensive patches. Other examples are the introduced European injurious insects, the gipsy moth, the scale insects, and many others, whose numbers in the Old World are kept within due limits by ichneumon parasites, but which in the United States and Canada, owing to the absence of their natural enemies, breed in unlimited numbers. Another case is that of the Colorado potato-beetle, which spread eastward from comparatively limited tracts in the Rocky Mountain region, and invaded the eastern States to the shores of the Atlantic. The English sparrow, introduced during a period from 1850 to 1870 has become, owing to the lack of competition, a grievous pest, driving out the native birds. The periwinkle (*Littorina littorea*) of the European coast, introduced on our shores, about 1855, has multiplied to such an extent that it lives between tide-marks in millions, to one of our native species of the same genus. Such cases as these throw light upon the subject and prove that there is a silent but unceasing struggle for existence going on over nearly all the earth's surface. Yet in the case of desert plants which grow sparsely, separated by barren spaces, there is, as Henslow has observed, no struggle for existence.

Nowhere is the agency of competition more marked than in human society. In the lower savage races, as in the black race of Africa or the natives of Australia, the scattered tribes have confined their contests to simple raids, and no single people or sub-race has gained marked pre-eminence over another, with the exception of the Hottentots and Bushmen, who were largely exterminated by negro tribes from the north. But as we ascend to the higher or white race, to the Semitic, the western Asiatic and European peoples, we have examples of the sudden rise to power and pre-eminence of vast hordes of barbarian peoples under Tamerlane, the Grand Mogul, Attila, and other conquerors, which have swept over vast territories and crushed the weaker, more peaceful, or even civilized but less resistant nations. The rapidity with which the Arabs overran and still dominate northern Africa in language, social customs and religion; the Mongolian movements eastward into China, and westward to the bor-

ders of Europe; the successive rise and irresistible waves of migratory hordes from eastern to northern Europe, throughout prehistoric and historic times; the colonizing and expansion of the powers of Greece, of Rome, of the Norsemen, Anglo-Saxon, the Spanish, French, and German peoples; the success of the white race in the struggle for pre-eminence; the disappearance of the lower, weaker races, less favored intellectually and morally, some of which had become fossilized, or semi-fossilized, and practically inept and unfit,—all these phenomena, which are historic facts, are of a piece with what we witness, though in a less distinct and marked way, in the plant and brute realms. The results are in the long run beneficent, though the injustice, moral degeneration, suffering, and evils which attend human progress are pitiful and deplorable. Consult: Darwin, 'Origin of Species'; Wallace, 'Darwinism'; Fredericq, 'La Lutte puer l'existence chez les Animaux Marins.'

Compiègne, kôn-pē-ān'yŭ, France, a town in the department of Oise, and on the left bank of the river Oise, 45 miles north-northeast of Paris. It has a tribunal of commerce, a communal college, a public library, a theatre, manufactures of muslin, hosiery, and cordage, besides a trade in wood and grain. The splendid chateau, surrounded by its extensive and beautiful park, bordering on the celebrated forest of Compiègne, was a favorite autumnal residence of Napoleon III. Charles VI. took this town from the Duke of Burgundy in 1415. In 1430 Joan of Arc was taken prisoner here by the English. Pop. (1902) 14,106.

Complaint, in Law, the name given in some States to the written statement on which the plaintiff's case is founded. In criminal law, an allegation made to a proper officer that a designated offense has been committed, accompanied by an offer to prove, and a request that the offender be punished.

Complement, that which fills up to a certain unit. Thus the complement of an angle is the angle which would, by addition, make the given angle a right angle; and the complement of a number is a number which would, by addition, make the given number equal to the next higher unit, or the next higher power of 10.

In medicine the complement or the complementary body is supposed to be a substance in the blood serum that is necessary for its antibacterial or bacteriolytic action. In order to bring about a lysogenic action (*Pfeiffer phenomenon*), two bodies seem to be necessary in the blood serum. One known as the immune serum is developed during the process of immunization. It alone cannot however cause bacteriolysis. There must be present in the blood serum another body, the complement. Also called alexine or cytase. See IMMUNITY.

Complete Angler, The, a famous book by Izaak Walton, first published in 1653. It was designed primarily by its author to teach the art of angling, of which long experience with hook and line had made him master. It is written in dialogue form, and is filled with conversations touching the theme in question, which are carried on by an angler, a hunter, a falconer, a milkmaid, and others. The book is filled with descriptions of rural scenery and interspersed with many charming lyrics, old songs and ballads.

COMPLEX VARIABLE

The 'Angler' is not alone devoted to sport, but is filled with precepts which recommend the practice of religion and the exercise of patience, humility, contentment, and other virtues. Whether considered as a treatise on the art of angling, or as a delightful pastoral filled with charming descriptions of rural scenery, 'The Complete Angler' ranks among English classics. In 1676, when Walton was preparing a fifth edition for the press, Charles Cotton, also a famous angler, and an adopted son of Walton, wrote a second part for the book, which is a valuable supplement. Walton, though an expert angler, knew but little of fly-fishing, and so welcomed Cotton's supplement, which has since that time been received as a part of his book.

Complex Variable, Theory of Functions of a

1. *Function*.—The Theory of Functions of a Complex Variable deals with ordinary complex numbers, $z = x + yi$, when x and y are real, and i denotes the pure imaginary number $\sqrt{-1}$. Just as real numbers are represented by points on a line, e.g., the points of the axis of x in analytic geometry, so complex numbers are represented by points in a plane, called the *complex plane*, z corresponding to that point whose Cartesian coordinates are (x, y) . The distance $\sqrt{x^2 + y^2}$ of z from the point $z = 0$ is called the *absolute value* of z and is written $|z|$. Let S denote a region of the plane bounded by one or more closed curves. To every point z of S let one or more numbers w , real or complex, be assigned according to some definite law. Then w is said to be a single- or multiple-valued *function* of z : $w = f(z)$. For the present we shall restrict ourselves to single-valued functions.

2. *Continuity and Limits*.—The function $w = f(z)$ is *continuous* in the region S if, when z describes any continuous curve in S , the image w of z describes a continuous curve in the w -plane. The variable $f(z)$ is said to *approach* b as its *limit*, if, when z approaches a along an arbitrary path, the corresponding point $w = f(z)$ approaches the point $w = b$; in symbols,

$$\lim_{z \rightarrow a} f(z) = b.$$

A complex variable z is said to *become infinite*: $\lim z = \infty$, if its absolute value becomes infinite; i.e., if the corresponding point of the complex plane recedes indefinitely, no matter in what direction.

3. *Derivative*.—The function $w = f(z)$ has a *derivative*, $f'(z)$, if the quotient $\Delta w / \Delta z$ approaches a limit, when Δz approaches 0:

$$\lim_{\Delta z \rightarrow 0} \frac{f(z + \Delta z) - f(z)}{\Delta z} = f'(z) = D_z w.$$

When z is the independent variable,

$$dw = D_z w \Delta z;$$

and it is shown, as in the Diff. Calc., that

$$dz = \Delta z \quad \text{and} \quad dw = D_z w dz,$$

the latter relation holding no matter what the independent variable may be. The general rules for differentiation apply here, e.g.,

$$d(U + V) = dU + dV, \quad \text{etc.}$$

Moreover, we have

$$\frac{d(z^n)}{dz} = n z^{n-1}, \quad n = \text{pos. integer.}$$

Hence it follows that all rational integral functions, i.e., polynomials in z , and all other rational functions of z , can be differentiated according to the same rules as reals.

Theorem: The necessary and sufficient condition that the function

$$w = u + vi = f(x + yi)$$

have a continuous derivative is that the real functions u and v of the real variables x and y have continuous first partial derivatives satisfying the *Cauchy-Riemann Differential Equations*:

$$\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}, \quad \frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}. \quad (1)$$

The condition is necessary. For since we shall always get one and the same limit, no matter along what path Δz may approach 0, let Δz pass first only through real values: $\Delta z = \Delta x$; thus

$$\lim_{\Delta x \rightarrow 0} \frac{\Delta w}{\Delta x} = \frac{\partial w}{\partial x} = D_z w.$$

Secondly, let Δz be pure imaginary: $\Delta z = i \Delta y$; then

$$\lim_{\Delta y \rightarrow 0} \frac{\Delta w}{i \Delta y} = \frac{1}{i} \frac{\partial w}{\partial y} = D_z w.$$

Hence

$$\frac{\partial w}{\partial x} = \frac{1}{i} \frac{\partial w}{\partial y},$$

and it remains only to separate the real and the pure imaginary terms. We omit the proof of the sufficiency of the condition.

Two functions which satisfy relations (1) are called *conjugate functions*.

Example: Let

$$w = e^x (\cos y + i \sin y).$$

Then

$$\frac{\partial u}{\partial x} = e^x \cos y = \frac{\partial v}{\partial y},$$

$$\frac{\partial u}{\partial y} = -e^x \sin y = -\frac{\partial v}{\partial x}.$$

Hence w has a derivative, and furthermore

$$\frac{dw}{dz} = w.$$

A function which is single-valued throughout a region S and has a continuous derivative in S is said to be *analytic in S* . The terms *holomorphic*, *monogenic*, and *synectic* are also sometimes used in this sense.

4. *Conformal Mapping*.—Given any two functions

$$u = \phi(x, y), \quad v = \psi(x, y), \quad (2)$$

we may interpret them geometrically as transforming the points of one plane into the points (u, v) of a second plane. Thus a region S of the first plane will be *mapped*, if certain further conditions are fulfilled, in a one-to-one manner and continuously on a region Σ of the (u, v) -plane. For example, let

$$u = x^2 - y^2, \quad v = 2xy.$$

Here the first quadrant of the (x, y) -plane is mapped on the upper half of the (u, v) -plane, the family of lines $u = \text{const.}$ going over into the

family of equilateral hyperbolas whose axes lie in the coordinate axes, and the family of

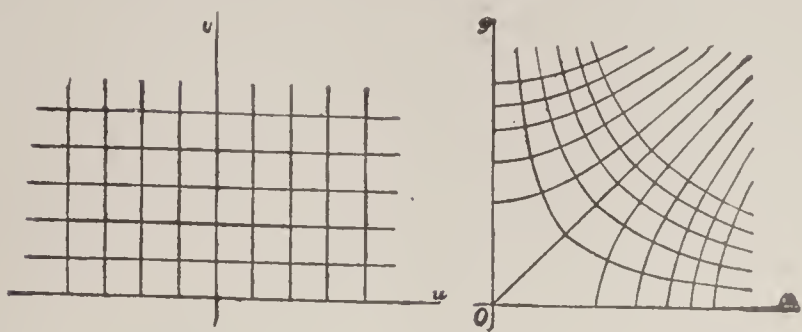


FIG. 1.

lines $v = \text{const.}$ going over into the orthogonal family, whose asymptotes are these axes.

If u and v have continuous first partial derivatives and if their Jacobian

$$J = \begin{vmatrix} \frac{\partial u}{\partial x} & \frac{\partial u}{\partial y} \\ \frac{\partial v}{\partial x} & \frac{\partial v}{\partial y} \end{vmatrix}$$

does not vanish, then, at least for a restricted region S_0 about a point (x_0, y_0) , the equations (2) will always define a one-to-one map of S_0 on a region Σ_0 including the point (u_0, v_0) . This map will represent approximately (*i.e.*, to infinitesimals of higher order than the first) a projection of the immediate neighborhood of (x_0, y_0) on that of (u_0, v_0) ; in other words, *strain*—a small circle about (x_0, y_0) going approximately into an ellipse about (u_0, v_0) . If, however, u and v are conjugate functions, the ellipse becomes a circle, and the angle under which two curves intersect in the (x, y) -plane is preserved in the (u, v) -plane. Thus the shapes of small figures are but slightly distorted. Such a map is called *conformal* or *isogonal*. The elements of corresponding infinitesimal arcs in the two planes are connected by the relation

$$dS = M ds,$$

where M is a positive function of x and y , and does not depend on ds , dS . The Jacobian here has the value

$$J = \left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial v}{\partial x}\right)^2.$$

Referring to the developments of § 3 we see that the theorem just stated is coextensive with the following.

Theorem: If $w = f(z)$ is single-valued and analytic in the region S , then this function maps the neighborhood of any point z_0 of S , in which $f'(z_0) \neq 0$, in a one-to-one manner and conformally on the neighborhood of the point $w_0 = f(z_0)$.

The problem of conformal mapping first studied was that of making a map of the earth such that the shapes of small regions should be but slightly distorted. The two principal solutions that presented themselves were (a) *Ptolemy's Projection*, known in mathematics as *stereographic projection*, which consists in passing a variable ray through a fixed point of the sphere, which we will think of as the north pole. Let P and Q be respectively the variable intersections of this ray with the sphere and with the plane of the equator, or a parallel plane, taken as the plane of the projection. Then Q is the projection of P . (b) *Mercator's Chart*.

By a *simply connected region* is meant a region bounded by a single curve. Any simply connected region can be mapped in a one-to-one manner and conformally on the interior of a circle, and hence any two such regions can be mapped conformally on each other (Riemann, 1851).

5. *The Elementary Functions.*—(a) The Exponential Function. For real values of x the function e^x can be expanded by Taylor's Theorem into the series

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

Substituting formally for x a pure imaginary value and operating with the infinite series as if it were a polynomial, we get

$$1 - \frac{y^2}{2!} + \frac{y^4}{4!} - \frac{y^6}{6!} \dots + i \left(y - \frac{y^3}{3!} + \frac{y^5}{5!} - \frac{y^7}{7!} \dots \right) \\ = \cos y + i \sin y.$$

This formal work suggests a *definition* of e^x for a pure imaginary value of the argument, namely:

$$e^{yi} = \cos y + i \sin y, \quad (3)$$

and it is this definition that we shall adopt, setting at the same time more generally

$$e^z = e^{x+yi} = e^x (\cos y + i \sin y).$$

The function e^z thus obtained is a true generalization of e^x , for it is single-valued and analytic for all values of z , reduces to e^x when z is real, and satisfies the same functional relations as e^x :

$$e^{z_1} e^{z_2} = e^{z_1+z_2}, \quad \frac{de^z}{dz} = e^z.$$

(b) The Trigonometric Functions. When x is real, we have from (3)

$$\sin x = \frac{e^{xi} - e^{-xi}}{2i}, \quad \cos x = \frac{e^{xi} + e^{-xi}}{2}.$$

The right-hand sides of these equations have a meaning for complex values of the argument. By means of them we define the functions $\sin z$, $\cos z$:

$$\sin z = \frac{e^{zi} - e^{-zi}}{2i}, \quad \cos z = \frac{e^{zi} + e^{-zi}}{2}.$$

These generalized functions are single-valued and analytic for all values of z and satisfy the same functional relations as $\sin x$, $\cos x$; *e.g.*,

$$\sin(z_1 + z_2) = \sin z_1 \cos z_2 + \cos z_1 \sin z_2.$$

The $\tan z$ is defined as $\sin z / \cos z$, etc.

(c) The Inverse Functions. The function $\log z$ shall be defined as the inverse of the exponential function:

$$e^w = z, \quad w = \log z.$$

Setting $w = u + vi$, $z = r(\cos \phi + i \sin \phi)$, we have

$$e^u (\cos v + i \sin v) = r(\cos \phi + i \sin \phi).$$

Hence $u = \log r$, $v = \phi + 2k\pi$, and

$$\log z = \log |z| + (\phi + 2k\pi)i.$$

Thus it appears that the logarithm is no longer single-valued when complex numbers are admitted to consideration. For example,

$$\log z = .693 \dots + 2k\pi i.$$

COMPLEX VARIABLE

In a similar way each of the other inverse functions is defined. We find

$$\begin{aligned}\cos^{-1}z &= i \log(z + \sqrt{z^2 - 1}), \\ \tan^{-1}z &= \frac{i}{2} \log \frac{i+z}{i-z}.\end{aligned}$$

From the foregoing it appears that in the domain of complex quantities the trigonometric functions can be expressed in simple form in terms of the exponential function and conversely; while the inverse trigonometric functions express themselves in terms of the logarithm. Thus the formulas of integration:

$$\int \frac{dx}{a+bx^2} = \begin{cases} \frac{1}{\sqrt{ab}} \tan^{-1}\left(x\sqrt{\frac{b}{a}}\right), & ab > 0; \\ \frac{1}{2\sqrt{-ab}} \log \frac{\sqrt{a}+x\sqrt{-b}}{\sqrt{a}-x\sqrt{-b}}, & ab < 0, \end{cases}$$

apparently in no wise akin, are seen to be equivalent in the complex domain.

6. *Laplace's Equation.*—(a) Flow of Heat or Electricity. Let the points of the boundary of a homogeneous (or more properly isotropic) conducting substance be maintained at given temperatures (for example, a steam-pipe, the interior being kept at 100° and the exterior at 0°). Then a flow of heat ensues within the conductor and the temperature at any given point approaches a limiting value, u , as time goes on. In fact, if each point were brought to this limiting temperature, it would continue there so long as the boundary conditions are maintained and we should have a steady flow. The corresponding temperature u satisfies Laplace's Equation in three dimensions:

$$\Delta u = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0.$$

If in particular the solid be bounded by cylindrical surfaces whose elements are parallel to the z -axis, and if the given temperature be constant along each element, then u will evidently be constant along any line parallel to the z -axis, and we shall have in substance a two-dimensional flow, for which

$$\Delta u \equiv \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0.$$

We may conceive the solid itself in which the flow takes place as two-dimensional if we think of a thin section as cut out of the above solid by two planes parallel to the (x, y) -plane and very near together. The flat faces of this slab are then to be thought of as coated with some adiabatic substance, so that no heat can enter or leave the slab across these faces.

The electrical problem is mathematically identical with the heat problem, u being interpreted as *potential* instead of temperature. As conductor consider for example a piece of tin-foil whose edge is connected with a thick piece of copper. Let one pole of a battery be attached to the copper and the other to the tin-foil at an interior point. We thus have a point source.

The curves $u = \text{const.}$ are called *isothermals* or *equipotential curves*. The curves $v = \text{const.}$ are the *lines of flow*. Every solution of a two-dimensional problem in steady flow leads to the solution of a second such problem, in which u and v are interchanged; for if u satisfies Laplace's Equation, then it follows from (1) that v does also.

(b) Flow of an Incompressible Fluid. Consider the flow of an incompressible fluid constrained to move between two parallel planes, the particles which lie in any line perpendicular to the planes at any moment always remaining in that line. If there be a function u whose partial derivatives with regard to x and y give the components of the velocity of each particle of the fluid along the axes, then u is called the velocity potential. If u does not depend on t , we have a steady flow with velocity potential, and u here satisfies Laplace's Equation.

Conversely, let u be any *harmonic function*, i.e., a solution of Laplace's Equation, in two dimensions. Then this function defines a steady flow of heat, electricity, or an incompressible fluid with velocity potential.

Let us turn now to analytic functions of a complex variable:

$$w = u + vi = f(x + yi).$$

Differentiating the first of the equations (1) with regard to x , the second with regard to y , and adding, we see that v satisfies Laplace's Equation. Hence

Theorem: Every analytic function of a complex variable defines a steady flow of heat, electricity, or an incompressible fluid.

The converse is also true. Let us first recall the condition that

$$P dx + Q dy$$

be an exact differential, namely,

$$\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}.$$

If this condition is fulfilled throughout a finite region S , then

$$\int P dx + Q dy$$

taken over the complete boundary of S will vanish. Furthermore, if S has but a single boundary,

$$\int_{(a,b)}^{(x,y)} P dx + Q dy$$

will be a function of the upper limit (x, y) alone, not of the path of integration; cf. Goursat, ('Cours d'analyse,' vol. I, § 152.

Returning now to the main question, let u be any solution of Laplace's Equation, and form the function

$$v = \int_{(a,b)}^{(x,y)} -\frac{\partial u}{\partial y} dx + \frac{\partial u}{\partial x} dy + C.$$

Then the value of the integral will be independent of the path of integration,—at least if we confine ourselves to a finite region S with a single boundary. The derivatives of this function have the values

$$\frac{\partial v}{\partial x} = -\frac{\partial u}{\partial y}, \quad \frac{\partial v}{\partial y} = \frac{\partial u}{\partial x},$$

and thus satisfy (1). Hence u and v are conjugate functions, and $u + vi$ is an analytic function of $x + yi$.

The relation here pointed out between the theory of functions of a complex variable and certain problems of mathematical physics was employed by Riemann (1851–1866) as a means of investigation in the former subject, and his

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method has been further developed by Klein (since 1881) and others.

7. *Cauchy's Theorem.*—Let $f(z)$ be single-valued and continuous throughout a region S , and let C be a curve lying in S . The integral of $f(z)$ taken along C is defined much as a curvilinear integral is in the calculus. Let C be divided by the points $z_0 = a, z_1, \dots, z_n = b$ into n arcs; set $z_{k+1} - z_k = \Delta z_k$. Then if, as n increases, the lengths of all the arcs approach 0,

$$\lim_{n \rightarrow \infty} \sum_{k=0}^{n-1} f(z_k) \Delta z_k = \int_a^b f(z) dz.$$

The following theorem, due to Cauchy (1825), is fundamental.

Cauchy's Integral Theorem. Let $f(z)$ be single-valued and continuous throughout a finite region S , inclusive of the boundary, and let $f(z)$ be analytic within S . Then the integral of $f(z)$, extended over the entire boundary C of S , has the value 0:

$$\int_C f(z) dz = 0.$$

Writing $f(z) = u + vi$, $z = x + yi$, we have

$$\int_C f(z) dz = \int_C (u dx - v dy) + i \int_C (v dx + u dy).$$

But each of these latter integrands is an exact differential (§ 6), since u and v are conjugate functions. Hence, by the theorem of § 6, each integral vanishes.

By means of this theorem many real definite integrals may be computed. In fact, it was through the attempt to obtain a rigorous deduction of such formulas that Cauchy was led to his theorem (memoir of 1814). We will give one example: Consider the integral of e^{-z^2} extended along the boundary of the region indicated. Its value is 0. Hence

$$\left(\int_{OA} + \int_{AB} + \int_{BO} \right) f(z) dz = 0.$$

Now let $OA = R$ increase without limit. The

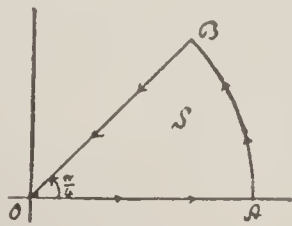


FIG. 2.

first integral thus becomes the well-known integral of the Theory of Probability:

$$\int_0^{\infty} e^{-x^2} dx = \frac{\sqrt{\pi}}{2}.$$

The second integral can readily be shown to approach the limit 0. In the third,

$$z = r(\cos 45^\circ + i \sin 45^\circ) = \frac{1}{\sqrt{2}}(1 + i)r.$$

Hence

$$\frac{\sqrt{\pi}}{2} + \frac{1}{\sqrt{2}}(1 + i) \int_0^{\infty} e^{-r^2 i} dr = 0.$$

Setting $e^{-r^2 i} = \cos r^2 + i \sin r^2$ and separating

reals and pure imaginaries, we obtain the evaluation of the Fresnel integrals:

$$\int_0^{\infty} \sin r^2 dr = \int_0^{\infty} \cos r^2 dr = \frac{1}{2} \sqrt{\frac{\pi}{2}}.$$

The *residuum* of a function $f(z)$ in a point a in whose neighborhood, with the exception of the point a itself, the function is single-valued and analytic, is defined as

$$\frac{1}{2\pi i} \int_C f(z) dz,$$

the path of integration C being a closed path surrounding the point a and containing no other singularity of the function. If $f(z)$ is single-valued and analytic in a finite region S except at a finite number of points lying within the region, then the sum of the residues of $f(z)$ at these points is given by

$$\frac{1}{2\pi i} \int_C f(z) dz,$$

where C refers to the boundary of S .

8. *Development into a Taylor's Series.*—In 1831 Cauchy extended Taylor's Theorem to functions of a complex variable and at the same

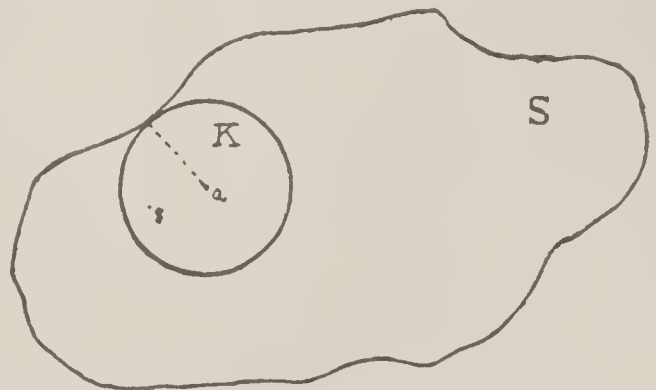


FIG. 3.

time discovered a simple test for the range of values of the variable for which the series converges. Let $f(z)$ be single-valued and analytic in a region S , and let a be an interior point of S . Let K be the largest circle that can be drawn in S with a as centre so as to include in its interior no point of the boundary of S . Then, for all points z within this circle, $f(z)$ can be represented by the series

$$f(z) = c_0 + c_1(z-a) + c_2(z-a)^2 + \dots,$$

where
$$c_n = \frac{1}{2\pi i} \int_C \frac{f(t) dt}{(t-a)^{n+1}} = \frac{f^{(n)}(a)}{n!},$$

and
$$|c_n| < Mr^{-n},$$

where M denotes the maximum value of $|f(z)|$ on the circumference of the circle $|z-a| = r$.

Example. Let $f(z) = (1 - 2\mu z + z^2)^{-\frac{1}{2}}$, where μ is a real constant numerically less than 1. Here either value of the function is continuous and analytic except where the radicand vanishes:

$$1 - 2\mu z + z^2 = 0, \quad z = \mu \pm i\sqrt{1 - \mu^2},$$

i.e., at two points on the unit circle about $z=0$. Hence we can develop either value of the radical into a Taylor's series:

$$\frac{1}{\sqrt{1 - 2\mu z + z^2}} = P_0 + P_1 z + P_2 z^2 + \dots,$$

where the coefficients P_n depend on μ alone, and the series will converge for all values of z within the unit circle.

COMPLEX VARIABLE

The proof of the theorem is based on Cauchy's Integral Formula, by means of which the value of the function $f(z)$ at any interior point of S can be expressed solely in terms of the value of $f(z)$ along the boundary, C , of S :

$$f(z) = \frac{1}{2\pi i} \int_C \frac{f(t) dt}{t-z}.$$

This formula is deduced directly from Cauchy's Integral Theorem, and is analogous to the theorem in the Theory of the Potential by which the value of a harmonic function u at any point within a region is expressed in terms of its value $U(s)$ on the boundary, and of a function peculiar to the shape of the region, namely, the Green's Function G :

$$u = \frac{1}{2\pi} \int_C U \frac{\partial G}{\partial n} ds.$$

In fact, each formula can be deduced from the other one. The whole theory of functions of a complex variable can be based on Cauchy's Integral Formula as well as on the Taylor's development.

Conversely, let

$$c_0 + c_1 z + c_2 z^2 + \dots \quad (4)$$

be any power series converging for values of $z \neq 0$. Then it can be shown that this series converges within a certain circle of radius R and (excepting the special but important case that it converges for all values of z and thus represents a so-called *integral transcendental* function of z) diverges outside of the circle. Within this circle, called the *true circle of convergence*, the series represents an analytic function and forms in fact the Taylor's (or Maclaurin's) development of this function about the point $z = a = 0$.

9. *Other Series.*—(a) *Laurent's Series.* If $f(z)$ is single-valued and analytic within a circular ring of radii r_1 and r_2 about the point a , then $f(z)$ can be developed into a Laurent's Series:

$$f(z) = \sum_{n=-\infty}^{\infty} c_n (z-a)^n,$$

convergent for all values of z within this ring: $r_1 < |z-a| < r_2$. Here

$$c_n = \frac{1}{2\pi i} \int_C \frac{f(t) dt}{(t-a)^{n+1}}, \quad |c_n| \leq M r^{-n},$$

where C denotes a closed curve lying within the ring and encircling the point a , and M, r have the same meaning as in § 8.

(b) *Lagrange's Series.* Kepler's problem of developing a root w of the equation

$$w = a + z \sin w$$

(or more generally a function $\Phi(w)$ of this root) according to powers of z led Lagrange to formulate the following problem: To develop a root w of the equation

$$w = a + z f(w),$$

or more generally a function $\Phi(w)$ of this root, according to powers of z . He thus obtained the series that bears his name:

$$\Phi(w) = \Phi(a) + z \Phi'(a) f(a) + \sum_{n=2}^{\infty} \frac{z^n}{n!} \frac{d^{n-1}}{da^{n-1}} [\Phi'(a) f(a)^n].$$

Example: Let $f(w) = \frac{1}{2}(w^2 - 1)$,

$$w = \frac{1 - \sqrt{1 - 2az + z^2}}{z}.$$

Then $\partial w / \partial a = (1 - 2az + z^2)^{-\frac{1}{2}}$ and

$$\frac{1}{\sqrt{1 - 2az + z^2}} = 1 + \sum_{n=1}^{\infty} \frac{z^n}{n!} \frac{d^n}{da^n} \left[\frac{(a^2 - 1)^n}{2^n} \right].$$

Thus the form of the coefficients P_n in the example of § 8 is determined:

$$P_n(\mu) = \frac{1}{n!} \frac{d^n}{d\mu^n} \left[\frac{(\mu^2 - 1)^n}{2^n} \right].$$

These functions are known as Zonal Harmonics.

10. *Roots and Singular Points.*—A function $f(z)$ is said to have a *root* or *zero* at an interior point a of the region S of § 8 if $f(a) = 0$. It follows that $f(z)$ can then be written in the form

$$f(z) = (z-a)^m [c_m + c_{m+1}(z-a) + \dots],$$

where m is a positive integer and $c_m \neq 0$ (unless $f(z) \equiv 0$). The point a is called a *root* or *zero* of *order* m ; $f(z)$ is sometimes said to have m roots in $z = a$. A circle of definite radius can always be drawn about the point a containing no further root of $f(z)$.

If $f(z)$ is single-valued and analytic throughout the neighborhood of a point a with the exception of this point itself, and if $f(z)$ becomes infinite no matter how z approaches a , then a is called a *pole* of $f(z)$. Since $1/f(z)$ then has a zero in a , $f(z)$ can be written in the form

$$f(z) = \frac{\phi(z)}{(z-a)^m},$$

where m is a positive integer and $\phi(z)$ remains finite and different from 0 at a ; $f(z)$ is said to have a pole of *order* m , or to have m (simple) poles in $z = a$.

If, however, $f(z)$ does not approach a limit when z approaches a , and does not have a pole there either, a is called an *essential singularity*. In the neighborhood of such a point Weierstrass has shown that the function comes as near as one pleases to any arbitrary preassigned value.

11. *Linear Transformations.*—The linear transformation

$$Z = \frac{az + b}{cz + d}, \quad ad - bc \neq 0,$$

plays an important rôle in the theory of functions. If $c = 0$, we have an *integral linear transformation*. Interpreted geometrically as a transformation of the plane into itself, it comprises as special cases:

- (a) $Z = z + b$, *i.e.*, a translation;
- (b) $Z = e^{ai} z$, " a rotation;
- (c) $Z = Az$, $A > 0$, " a stretching.

The general integral linear transformation can be generated by a succession of these transformations.

If, however, $c \neq 0$, we need to consider one further transformation:

$$(d) \quad Z = \frac{1}{z}.$$

This corresponds to an inversion in the unit circle: $R = 1/r$, followed by a reflection in the axis of reals: $Y = -y$.

The general linear transformation carries circles over into circles, straight lines being regarded, as in the geometry of inversion, as circles with infinite radii. The infinite region of the plane is considered as a *point* (not, as in

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projective geometry, as a line), and this is the convention which it is desirable, for reasons that cannot be named here, to make in the theory of functions. We speak of *the point* $z = \infty$.—Cf. an article by F. N. Cole, 'Linear Functions of a Complex Variable,' *Annals of Math.*, ser. 1, vol. 5 (1890), p. 121.

12. *Multiple-Valued Functions*.—When in the definition of § 1 more than one value is assigned to each point of S , the first thing to be done is to group these values in such a way that they form several single-valued functions. Consider for example the function \sqrt{z} . Setting

$$w = Re^{\phi i}, \quad z = re^{\phi i},$$

we have

$$R = \sqrt{r}, \quad \Phi = \frac{1}{2}\phi, \quad \frac{1}{2}\phi + \pi.$$

If now we sever the plane along a line running from $z=0$ to $z=\infty$, say along the positive axis of reals, we can then spread out two single-valued functions each analytic in this region, namely,

$$w_1 = \sqrt{r}e^{\frac{\phi i}{2}} \quad \text{and} \quad w_2 = -\sqrt{r}e^{\frac{\phi i}{2}},$$

and these two functions together just exhaust the values of the multiple-valued function \sqrt{z} . Let us, therefore, consider two planes instead of one, each severed along the cut in question and lying one above the other like the leaves of a book, and assign the values w_1 to the points of the one plane, w_2 to those of the other. We observe, furthermore, that the values of w_1 along the upper side of the cut in its leaf and those of w_2 along the lower side of the cut in the second leaf agree with each other. Let these two edges be united, so that z , moving continuously in the surface thus formed, will pass from leaf I to leaf II without interruption when it crosses the positive axis of reals from the upper side. Similarly the values of w_1 along the lower edge of the cut in leaf I and those of w_2 along the upper edge of the cut in leaf II correspond. Hence we shall unite these two edges. The final result is a closed surface of two sheets in which the function \sqrt{z} is single-valued. The sheets cut through each other along a line; but the point z in crossing this line is not at liberty to pass into either sheet. z has not come to a fork in the road, but to a switch which has already been set, and its further course is definitely determined.

The point $z=0$ is called a *branch-point*, the cut a *junction-line*.

More generally, let

$$G(w, z) = A_0(z)w^m + A_1(z)w^{m-1} + \dots + A_m(z) = 0$$

be an algebraic equation. Then to each value of z correspond in general m distinct values w_1, \dots, w_m . Mark the points a_1, \dots, a_k (finite in number) for which this is not the case. Draw a curve C , not cutting itself, through these points and continue C from the last point to $z=\infty$. Then spread out m leaves over the z -plane and cut each leaf along C . The m values w_1, \dots, w_m of the function can now be assigned to the points of these leaves so as to form m single-valued functions analytic throughout these regions. Finally, corresponding edges of the leaves are to be connected along each of the segments into which C is divided by the points a_1, \dots, a_k, ∞ . The result is a closed surface

on which w is a single-valued function of z . If $G(w, z)$ is irreducible, the surface will consist of a single piece, and conversely. A branch-point in which μ leaves are connected in cycle is said to be of order $\mu - 1$.

The surfaces here described are due to Riemann (Göttingen, thesis for the doctorate, 1851) and are known as *Riemann's Surfaces*. Corresponding to any given analytic function there can always be constructed a Riemann's surface on which the function becomes single-valued. In all ordinary cases the leaves are joined together in cycle in branch-points, and they always pass over into each other along junction lines, never merely at isolated points.

13. *Analytic Continuation*.—If a function $f(z)$ be single-valued and analytic in a region S , it may happen that the function can be defined



FIG. 4.

in an adjacent region S_1 in such a way that the extended function is analytic throughout the enlarged region (S, S_1) . In this case $f(z)$ is said to be *continued analytically* beyond the region S into the region S_1 . There can never be two distinct analytic continuations of $f(z)$ into S_1 . If S_1 overlaps S , it will in general be necessary to introduce a Riemann's surface for the extended function.

Consider, for example, a function given by the power series (4). Let $z_0 \neq 0$ be an interior point of the circle of convergence K . Develop the function by Taylor's Theorem about the point z_0 . The new power series, which proceeds according to powers of $z - z_0$, will surely converge within a circle tangent internally to K , and it may converge throughout a larger circle K_1 . In the latter case analytic continuation is possible, the region S_1 corresponding to the part of K_1 exterior to K .

We are now in a position to complete the definition, according to Weierstrass, of an analytic function. Let $f(z)$ be analytic in a given region S . Continue $f(z)$, if possible, analytically beyond S . Repeat this step so long as it is possible to do so. The most extended function that can thus be generated out of the given function is known as the *monogenic analytic function* $f(z)$. It is uniquely determined by the values of $f(z)$ in S . Weierstrass employed the method of overlapping circles and power series for obtaining the successive analytic continuations. The function is completely defined as soon as any one of these power series, called *elements*, is known.

The rational functions and the elementary functions e^z , $\log z$, etc., are examples of monogenic analytic functions. By an *algebraic function* is meant any monogenic analytic function which satisfies an algebraic equation, $G(w, z) = 0$, where G denotes a polynomial. Every irreducible algebraic equation in w and z defines such a function.

Two analytic functions which agree in value with each other along an arc of a curve, however short, lying wholly within their domain of defi-

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dition, are identical throughout their whole extent.

It may happen that the singular points of an analytic function are not isolated, but fill a curve (for example an arc or the whole circumference of a circle, the latter being the case with the function defined by the series

$$\sum_{n=1}^{\infty} z^n!$$

throughout the interior of the unit circle $|z| < 1$), so that the function is analytic up to the curve, but cannot be extended beyond it. Such a curve is called a *natural boundary*. A region of the plane into which a given function cannot be continued analytically is called a *lacunary space*.

14. *Reflection in Analytic Curves*.—A curve which can be represented by the equations

$$x = f(t), \quad y = \phi(t), \quad a \leq t \leq b,$$

where f and ϕ are both developable by Taylor's Theorem about every point t_0 of the above interval and where, furthermore, $f'(t)$ and $\phi'(t)$ never vanish simultaneously in the interval, is called an *analytic curve*.

Let S be a region bounded in part or wholly by an analytic curve Γ having no multiple point. If

$$u + vi = f(z)$$

is analytic in S and takes on real boundary values along Γ , then $f(z)$ can always be continued analytically across Γ . In particular, let Γ be an arc of a circle. Then the analytic continuation is effected by inverting S in this circle and assigning to $f(z)$ in the transformed points values conjugate to those in the original points. The method is fundamental in the study of minimum surfaces, and of the elliptic modular and the automorphic functions.

15. *Dirichlet's Principle*.—In order to show that a simply connected region S can be mapped in a one-to-one manner and conformally on a circle (§ 4), it is necessary to establish the existence of a function u which (a) is single-valued and continuous in S , (b) satisfies Laplace's Equation (§ 6) throughout the interior of S , and (c) takes on preassigned values along the boundary of S . In similar cases in mathematical physics Gauss, Thomson, and Dirichlet had attempted to give a proof of the existence of such a function by making connections with a skilfully constructed corresponding problem of the Calculus of Variations. Riemann adopted this method in order to obtain his existence proofs, both for the present problem and for the case of algebraic functions corresponding to a preassigned Riemann's surface. The problem of the Calculus of Variations which matches the present problem is as follows: To find a function u which is continuous in S , together with its first derivatives, takes on the prescribed boundary values, and makes the integral

$$\int_S \int \left[\left(\frac{\partial u}{\partial x} \right)^2 + \left(\frac{\partial u}{\partial y} \right)^2 \right] dS$$

a minimum. If such a function exists and if, furthermore, it has continuous second derivatives, then it will satisfy Laplace's Equation within S and thus yield the desired solution. It was assumed by the mathematicians named above that the problem of the Calculus of Varia-

tions necessarily has a solution. This method of proof is known as *Dirichlet's Principle*. Weierstrass pointed out the insufficiency of the reasoning involved in the assumption to which we have just called attention. Other methods of proof were then devised by Schwarz and Neumann. Recently Hilbert has, with considerable labor, partially filled the gap in the original method.

16. *Weierstrass's and Mittag-Leffler's Theorems*.—It is always possible to form a polynomial which has n roots situated arbitrarily in the complex plane. The question presents itself as to whether this theorem can be extended to transcendental integral functions. This question Weierstrass answered in 1876 as follows: Let a_0, a_1, \dots be any set of points in the complex plane such that $\lim a_n = \infty$ when $n = \infty$. Then there exists an integral transcendental function $G(z)$ which has in each of the points a_n a zero of arbitrarily preassigned order, and does not vanish for any other value of z . The most general such function is given by the formula

$$G(z) = e^{\Gamma(z)} \mathfrak{G}(z),$$

where \mathfrak{G} denotes a particular function of the class in question and Γ is a rational or transcendental integral function. This theorem has formed the point of departure for many recent researches, chiefly of French mathematicians.

Mittag-Leffler's Theorem: Let a_0, a_1, \dots be any set of points in the complex plane such that $\lim a_n = \infty$ when $n = \infty$. In each of these points let an arbitrary polynomial in $1/(z - a_n)$:

$$f_n(z) = \frac{A_1^{(n)}}{z - a_n} + \frac{A_2^{(n)}}{(z - a_n)^2} + \dots + \frac{A_\kappa^{(n)}}{(z - a_n)^\kappa},$$

be chosen. Then there exists a single-valued function $F(z)$ analytic throughout the whole plane except at the points a_n and behaving in each of these points like $f_n(z)$; *i.e.*, the difference

$$F(z) - f_n(z)$$

has no singularity in the point a_n . The most general such function is given by the formula

$$F(z) = \mathfrak{F}(z) + G(z),$$

where \mathfrak{F} denotes a particular function of the class in question and G is an integral function, rational or transcendental.

17. *Elliptic and Abelian Integrals*.—The motion of a simple pendulum and the length of the arc of an ellipse lead respectively to the elliptic integrals

$$\int_0^x \frac{dx}{y}, \quad \int_0^x \frac{y dx}{1 - x^2},$$

where $y^2 = (1 - x^2)(1 - k^2 x^2)$, $0 < k < 1$.

If we set the first of these integrals equal to w and let x take on complex values z , then the inverse function z :

$$w = \int_0^z \frac{dz}{\sqrt{(1 - z^2)(1 - k^2 z^2)}}, \quad z = \sin \operatorname{am} w,$$

turns out to be a single-valued function of its argument w having two linearly independent periods (§ 18) and being analytic throughout the whole w -plane except for poles.

A generalization which now presents itself is the following: The integrand in each of the foregoing cases is a rational function of x and y ,

and these variables are connected by an algebraic equation. Consider, therefore, generally an algebraic equation

$$G(w, z) = 0,$$

where G denotes an irreducible polynomial in w and z , and construct the Riemann's surface corresponding to it. Let $R(w, z)$ be any rational function of w and z . Then, setting w equal to the algebraic function of z defined by the foregoing equation, we have in $R(w, z)$ a function which is single-valued and in general continuous on the above surface. If now we extend the definite integral

$$\int_{(w_0, z_0)}^{(w, z)} R(w, z) dz$$

along an arbitrary path on the surface, we have before us an *Abelian Integral*. It is obvious that the logarithm and the inverse trigonometric functions, e.g.,

$$\sin^{-1} z = \int_0^z \frac{dz}{w}, \quad z^2 + w^2 = 1,$$

are special cases of Abelian integrals. When the equation $G = 0$ is of the form

$$w^2 = f(z),$$

where $f(z)$ denotes a polynomial in z of degree > 4 having all distinct linear factors (or can be thrown into this form by means of birational transformations), the integral is called a *hyper-elliptic integral*.

The only Abelian integrals whose inverse function is single-valued are those which lead to the exponential (including trigonometric) and the elliptic functions. The *Abelian Functions* are single-valued periodic functions, not of a single argument, but of p independent variables, where p denotes the deficiency of the corresponding Riemann's surface $G(w, z) = 0$. They have $2p$ periods. These functions arise as the inverse functions $z_\kappa(w_1, \dots, w_p)$, ($\kappa = 1, \dots, p$) of a system of p equations:

$$w_\kappa = \int_{a_1}^{z_1} \phi_\kappa dz_1 + \dots + \int_{a_p}^{z_p} \phi_\kappa dz_p,$$

where the integrals $\int \phi_\kappa dz$ are p linearly independent Abelian integrals on the Riemann's surface for $G(w, z) = 0$.

18. *Automorphic Functions*.—A function $f(z)$ is said to admit a linear transformation into itself if

$$f\left(\frac{\alpha z + \beta}{\gamma z + \delta}\right) = f(z),$$

where α, \dots, δ are constants and $\alpha\delta - \beta\gamma \neq 0$. A familiar class of such functions are the *periodic functions*. Here the transformation reduces to a translation:

$$f(z + \omega) = f(z).$$

The most general single-valued periodic functions of a single variable z , which are in general analytic, are the *simply* and *doubly periodic functions*, i.e., those functions whose periods can all be expressed as integral multiples $n\omega$ of a single primitive period ω , or else in the form $n\omega + n'\omega'$, where ω and ω' form a primitive pair of periods. In the latter case ω/ω' cannot be a real quantity.

If the coefficients are integers and $\alpha\delta - \beta\gamma = \pm 1$, we have the *elliptic modular functions*. More generally the coefficients may have non-integral values, being restricted only in such a way that the transformations form a "discrete group." These most general functions, including the special cases above mentioned, are known as the *automorphic functions*.

19. *Definite Integrals*.—The Γ -function may be defined by the definite integral

$$\Gamma(z) = \int_0^\infty t^{z-1} e^{-t} dt,$$

the variable of integration t being real and positive. This integral converges only for values of z which lie to the right of the axis of pure imaginaries: $z = x + yi$, $x > 0$. A new definite integral can be formed as follows which converges for all values of $z \neq -n$, where n denotes a positive integer, namely,

$$\int_C t^{z-1} e^{-t} dt,$$

extended over the loop indicated in the figure.

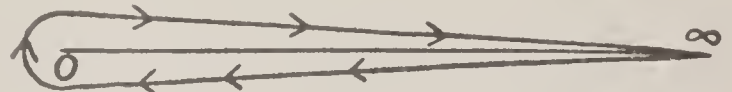


FIG. 5.

It is readily shown that the second integral is equal to the first multiplied by $1 - e^{2\pi iz}$ for all values of z for which the first integral converges. Hence we have generally

$$\Gamma(z) = \frac{1}{1 - e^{2\pi iz}} \int_C t^{z-1} e^{-t} dt.$$

By means of this integral the Γ -function has been systematically treated.

The above is an example of a *loop integral*, i.e., a definite integral extended over a certain *loop-circuit*. Such integrals have been generalized, being extended over *double circuits*, and these latter integrals are an aid in the study of the solutions of certain linear differential equations.

20. *Functions of Several Variables*.—In each of n complex planes let a region S_1, \dots, S_n be given, and let z_κ be an arbitrary point of S_κ . Then the set of values (z_1, \dots, z_n) is called from analogy with the case $n = 1$ a *point*. The totality of these points constitutes the *region* (S). In every point of S let a function $f(z_1, \dots, z_n)$ be uniquely defined. The idea of the limit and of continuity can be extended at once to such a function. $f(z_1, \dots, z_n)$ is said to be *analytic in* (S) if it is continuous in (S) and if, furthermore, when all the z_κ but one, — z_m , let us say, — are held fast, f is then analytic in S_m ; this condition to be satisfied for $m = 1, \dots, n$. For brevity let $n = 2$. Cauchy's Integral Formula becomes

$$f(z_1, z_2) = \frac{1}{(2\pi i)^2} \int_{C_1} \frac{dt_1}{t_1 - z_1} \int_{C_2} \frac{f(t_1, t_2) dt_2}{t_2 - z_2}.$$

The function can furthermore be developed by Taylor's Theorem as follows: Let (a_1, a_2) be an interior point of (S), and let K_κ be the largest circle that can be drawn in S_κ about a_κ as centre, containing in its interior no boundary point of S_κ . Then

$$f(z_1, z_2) = \sum_{l=0}^{\infty} \sum_{m=0}^{\infty} c_{lm} (z_1 - a_1)^l (z_2 - a_2)^m,$$

where

$$c_{lm} = \frac{1}{l! m!} \left. \frac{\partial^{l+m} f(z_1, z_2)}{\partial z_1^l \partial z_2^m} \right|_{(a_1, a_2)}$$

$$= \frac{1}{(2\pi i)^2} \int_{C_1} \frac{dt_1}{(t_1 - a_1)^{l+1}} \int_{C_2} \frac{f(t_1, t_2) dt_2}{(t_2 - a_2)^{m+1}},$$

and z_κ is an arbitrary interior point of the circle K_κ . We have, as in the case $n = 1$,

$$|c_{lm}| \leq M r_1^{-l} r_2^{-m},$$

where $|z_1 - a_1| = r_1$, $|z_2 - a_2| = r_2$.

The idea and the method of analytic continuation can be extended without difficulty to functions of several variables, and thus the *monogenic analytic function* is completely defined. For implicit functions and analytic configurations lying in hyperspace the reader is referred to the author's report in the *Encyklopädie*, §§ 44 and 47 (see below).

The following theorem is due to Weierstrass: Let (b, a_1, \dots, a_n) be an interior point of a region (S) in which $f(w, z_1, \dots, z_n)$ is analytic. Let f vanish at this point; but $f(w, a_1, \dots, a_n)$ shall not vanish identically. Then

$$f(w, z_1, \dots, z_n) = \{w^m + A_1 w^{m-1} + \dots + A_m\} \Phi,$$

where $\Phi(w, z_1, \dots, z_n)$ is analytic throughout a certain neighborhood of the point (b, a_1, \dots, a_n) and does not vanish there, while each of the coefficients $A_1(z_1, \dots, z_n), \dots, A_m(z_1, \dots, z_n)$ is single-valued and analytic throughout a region including the point (a_1, \dots, a_n) in its interior. The excluded case $f(w, a_1, \dots, a_n) \equiv 0$ is also treated by Weierstrass.

21. *Bibliography*.—Durège, 'Theory of Functions,' translated by Fischer & Schwatt; Forsyth, 'Theory of Functions'; Harkness and Morley, 'Treatise on the Theory of Functions' (1893), and 'Introduction to Analytic Functions' (1898); Goursat, 'Cours d'analyse' (vol. 2; in process of translation by Hedrick); Picard, 'Traité d'analyse' (vol. 2); Burkhardt, 'Analytische Funktionen'; Osgood, 'Lehrbuch der Funktionentheorie.' For a comprehensive report on the theory of functions, including numerous historical and bibliographical references, see the author's article: "Allgemeine Theorie der Funktionen a) einer und b) mehrerer komplexer Grössen," in 'Encyklopädie der mathematischen Wissenschaften,' vol. II, B. 1.

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Complex'ion, the term generally used to signify the special color or hue of a person's skin. The human skin, till the time of Malpighi, was supposed to consist only of two parts—the epidermis or outer skin, and the cutis or true skin; but that anatomist, about the middle of the 17th century, discovered between these a cellular texture, soft and gelatinous, to which the names of rete mucosum, rete Malpighi, or Malpighian tissue, have been given. He demonstrated the existence of this membrane at first in the tongue and in the inner parts of the hands and feet; but by his subsequent labors, and also by those of Ruysch and other anatomists, it was proved to exist, between the epidermis and cutis, in all parts of the human body. Malpighi, on the discovery of this membrane, offered a conjecture respecting the cause of the color of negroes. He supposed that this membrane contained a juice or fluid of a black color,

from which their blackness arose. The actual existence of a black pigment has been since ascertained. The rete mucosum is of very different colors in different nations; and the difference of its color so completely agrees with the difference of their complexions, that there can be no doubt that it is the sole, or, at least, the principal seat of the color of the human complexion. Its thickness varies in different parts of the body; and the depth of its color, for the most part, is in proportion to its thickness. It is now, however, not regarded as altogether a distinct tissue, being considered rather as the innermost and newest layer of the epidermis or cuticle. The black color of the negroes is destroyed by whatever destroys the rete mucosum, as wounds, burns, etc.; the scar remaining white ever afterward. The greatest contrast in complexion is between the fair white peoples of northern Europe and the ebony colored negro of Africa.

The nature and color of the hair seem closely connected with the complexion. In proportion to the thinness of the skin and the fairness of the complexion the hair is soft, fine, and of a white color; this observation holds good not only in the great varieties of the human race, but also in albinos. Next to them in fairness of complexion is the Teutonic race, the *rutilæ comæ* (fair locks) of whom were a distinguishing characteristic even in the time of the Romans. The Celtic people are not so fair as the Teutonic, and their hair is darker and less inclined to curl; but it is perhaps more difficult than in the case of the Teutons to be sure of unmixed blood. But though the color of the hair is evidently connected with the complexion, yet its tendency to curl does not appear to be so. Many brown complexion Celts have curled hair; the Mongolian and American races, of a much darker complexion, have hair of a darker color, but long and straight. Among that portion of the Malay race which inhabits some of the South Sea Islands, soft and curled hair is said to be met with. The color of the eye is also connected with the complexion. In the Africans, Prof. Sommering remarks that the white of the eye is not so resplendently white as in Europeans, but rather of a yellowish brown, something similar to what occurs in the jaundice. The iris in the negroes, in general, is of a very dark color; but the iris in the Congo negro is said to be frequently of a bluish tinge. The Teutonic tribes are not more distinguished by their fair complexion than by their blue eyes, —*cærulei oculi*, while the iris of the darker colored Finn is brown, and that of the still darker Laplander black. The color of the eyes also follows, in a great degree, in its changes, the variations produced by age in the complexion. The most singular class of people in point of complexion are the albinos, but albinism is not confined to the human race. An intermediate complexion is produced where children are born from parents of different races. If the offspring of the darkest African and the fairest European intermarry successively with Europeans, in the fourth generation they become white; when the circumstances are reversed, the result is reversed also. Along with the successive changes of complexion is also produced a change in the nature and color of the hair; though, in some instances, the woolly hair remains when the complexion has become nearly

COMPLEXION

as fair as that of brown people in Europe. It does not, however, always happen that the offspring is the intermediate color between that of the respective races to which the father and mother belong; it sometimes resembles one parent only, while, perhaps, in the second or third generation, the color of the other parent makes its appearance. An instance has been given of a negress who had twins by an Englishman: one was perfectly black; its hair was short, woolly, and curled: the other was white, with hair resembling that of a European. In another case the child of a black man and an English woman was quite black; and still more remarkable: a black married a white woman, who bore him a daughter, resembling the mother in features, and as fair in all respects, except that the right buttock and thigh were as black as the father's.

The generally received opinion concerning the varieties of complexion which are found in the different races of man throughout the globe is, that they are caused entirely by the influence of climate. Respecting the primary color of man the supporters of this opinion are not agreed. The opinion that climate alone will account for the various complexions of mankind is very plausible, and supported by the well-known facts that in Europe the complexion grows darker as the climate becomes warmer; that the complexion of the French is darker than that of the Germans, while the natives of the south of France and Germany are darker than those of the north; that the Italians and Spaniards are darker than the French, and the natives of the south of Italy and Spain darker than those in the north. The complexion also of the people of Africa and the East Indies is brought forward in support of this opinion; and from these and similar facts the broad and general conclusion is drawn, that the complexion varies in darkness as the heat of the climate increases; and that, therefore, climate alone has produced this variety. But it can be shown that the exceptions to this general rule are very numerous; that people of dark complexions are found in the coldest climates, people of fair complexions in warm climates, people of the same complexion throughout a great diversity of climate, and races differing materially in complexion dwelling near together.

1. In the coldest climates of Europe, Asia, and America we find races of a very dark complexion. The Laplanders have short, black, coarse hair; their skins are swarthy, and the irides of their eyes are black. According to Crantz the Greenlanders have small, black eyes; their body is dark gray all over; their face brown or olive; and their hair coal-black.

The complexion of the Samoiedes and other tribes who inhabit the north of Asia is very similar to that of the Laplanders and Greenlanders, who are Eskimos by race. Humboldt's observations on the South American Indians illustrate and confirm the same fact. If climate rendered the complexion of such of these Indians as live under the torrid zone, in the warm and sheltered valleys, of a dark hue, it ought also to render or preserve fair the complexion of such as inhabit the mountainous part of that country; for certainly, in point of climate, there must be as much difference between the heat of the valleys and of the mountains in South America as there is between the tempera-

ture of southern and northern Europe; and yet this author expressly assures us that "the Indians of the torrid zone, who inhabit the most elevated plains of the Cordillera of the Andes, and those who, under the 45th degree of south latitude, live by fishing among the islands of the archipelago of Chonos, have as coppery a complexion as those who, under a burning climate, cultivate bananas in the narrowest and deepest valleys of the equinoctial region." He adds, indeed, that the Indians of the mountains are clothed, but he never could observe that those parts which were covered were less dark than those which were exposed to the air. The inhabitants also of Tierra del Fuego, one of the coldest climates in the world, have dark complexions and hair.

2. Fair complexioned races are found in hot climates. Ulloa informs us that the heat of Guayaquil is greater than at Carthagená; and by experiment he ascertained the heat of the latter place to be greater than the heat of the hottest day at Paris; and yet in Guayaquil, "notwithstanding the heat of the climate, its natives are not tawny"; indeed they are "so fresh-colored, and so finely featured, as justly to be styled the handsomest, both in the province of Quito and even in all Peru." According to a statement of Humboldt, in the forests of Guiana, especially near the sources of the Orinoco, "are several tribes of a whitish complexion of whom several robust individuals, exhibiting no symptom of the asthenical malady which characterizes albinos, have the appearance of true Mestizos. Yet these tribes have never mingled with Europeans, and are surrounded with other tribes of a dark brown hue." The inhabitants of Boroa, a tribe in the heart of Araucania, are white, and in their features and complexion very like Europeans. Even in Africa darkness of complexion does not increase with the heat of the climate in all instances; the existence of comparatively fair races in this quarter of the globe is noticed by Ebn Haukal, an Arabian traveler of the 10th century, and has been confirmed by subsequent travelers.

3. The same complexion is found over immense tracts of country, comprehending all possible varieties of climate. The most striking and decisive instance of this is on the continent of America, all the inhabitants of which, with the exception of the Eskimo, exhibit the copper-colored skin and the long and straight black hair. Australia is an instance of a similar nature, though on a less extensive scale: over the whole of the island, even in the comparatively cool climate of the southern parts, the complexion of its inhabitants is of a deep black, and their hair is curled like that of negroes.

4. Different complexions are found under the same physical latitude, and among the same people. Illustrations and proofs of this have already been given. The physical latitude in which the Norwegians, the Icelanders, the Finns, and the Laplanders live scarcely differs; and yet their complexion, and the color of their eyes and hair, are widely different. There is a great diversity of color and features among the Morlachs, who inhabit Dalmatia. The inhabitants of Kotar, and of the plains of Seigu and Knin, have fair blue eyes, broad face, and flat nose. Those of Duare and Vergoraz, on the contrary, have dark-colored hair; their face is long, their complexion tawny, and their stature tall. M.

COMPLEXION

Sauche, who traveled among the Tartars in the southern provinces of Russia, describes a race or tribe as having countenances as white and fresh as any in Europe, with large black eyes. In the south of Africa we find the **Kafirs**, who are of a brown or iron-gray color, and the Hottentots of a yellow color. In the island of Madagascar, according to Mr. Sibree, the observer "finds almost every shade of color from a very light olive, not darker than is seen in the peoples of southern Europe, down through all gradations of brown to a tint which although not black is certainly very dark. In the quality of the hair, too, there is a good deal of difference; the lighter-colored people having usually long, black, and straight hair, while the darker tribes have, as a rule, shorter and more frizzly hair."

Besides a Malayan olive-colored race, people with the negro complexion and features are found in the Philippine Islands; and in Java, the Hindu, and Malay character may be clearly traced in the complexion and features of the two classes of inhabitants which are found in that island. In several of the Moluccas is a race of men who are blacker than the rest, with woolly hair, inhabiting the interior, hilly parts of the country. The shores of these islands are peopled by another nation, whose inhabitants are swarthy, with curled, long hair. In the interior hilly parts of Formosa the inhabitants are brown, frizzle-haired, and broad-faced; while the Chinese occupy the shores.

It is observed that there are two great varieties of people in the Pacific islands; the one more fair, the other blacker, with their hair just beginning to be woolly and crisp. The first race inhabits Tahiti and other of the Society Islands, the Marquesas, the Friendly Isles, Easter Island, and New Zealand; the second race peoples New Caledonia, Tanna, and the New Hebrides, especially Mallicolo. If we examine the relative situation and latitudes of these islands on a map, we shall be convinced not only that darker complexioned people are found where the climate is comparatively colder, but that the same complexion is found under very different latitudes. It is not meant to be denied that a burning climate will render the complexion very dark, and that a climate of less extreme heat will bronze the complexion of the fairest European; but there are some material points in which the dark complexion of the Caucasian, or naturally fair-skinned variety of mankind, caused by climate, differs from the dark complexion of all the other varieties of the human race.

1. The offspring of the Caucasian variety is born fair; the offspring of the other varieties is born of the respective complexion of their parents. Ulloa informs us that the children born in Guayaquil of Spanish parents are very fair. The same is the case in the West Indies. Long, in his history of Jamaica, expressly affirms "that the children born in England have not, in general, lovelier or more transparent skins than the offspring of white parents in Jamaica." But it may be urged that this is not the case with respect to the other nations of the Caucasian variety, who have been settled in warm climates from time immemorial, and that the question ought to be decided by the Moors, Arabians, etc. Their children, however, are also born fair complexioned, as fair as the children of Europeans who live under a cold climate. Russell

informs us that the inhabitants of the country round Aleppo are naturally of a fair complexion, and that women of condition, with proper care, preserve their fair complexion to the last. The children of the Moors, according to Shaw, have the finest complexions of any nation whatsoever; and the testimony of Poiret is directly to the same effect. "The Moors are not naturally black, but are born fair, and when not exposed to the heat of the sun remain fair during their lives."

2. Individuals belonging to the Caucasian variety, that inhabit warm countries, preserve their native fairness of complexion if they are not exposed to the influence of the climate; while there is a uniform black color over all the parts of a negro's body. The hue which Europeans assume is the same, though the tinge may be lighter or darker, whether they settle in Africa, the East Indies, or South America. They do not become, like the natives of those countries, black, olive-colored, or copper-colored; their complexion merely resembles that of a tanned person in this country, only of a darker tinge. The negroes that are settled in the West Indies or America do not assume the copper color of the Indians, even though a milder climate may have some effect on the darkness of their complexions. The children of Europeans, of negroes, and of Indians are all born, in America, of the same reddish hue; but in a few days those of the negro begin to assume the black complexion of their parents, those of the Indian the copper complexion, while those of the European either continue fair, if kept from the influence of the sun, or become tanned; not black like the negro, or copper-colored like the Indian, if exposed to its influence. Europeans who settle in Canada, or in the northern parts of America, where the climate resembles that of their native country, do not assume the complexion of the Indians, but continue fair like their ancestors. The same observation may be made respecting the Russians who are settled among the Mongolian variety, in those parts of the Russian empire in Asia, the climate of which resembles the middle or northern parts of European Russia. Indeed the wide extent of country over which the Mongolian variety is spread, including the extreme cold of Lapland and the north of Asia, the mild temperature of the middle parts of that continent, and the warmth of the southern parts of China, is in itself a proof that dark complexion does not arise either from the influence of heat or cold.

Lastly, radical varieties of complexion are always accompanied with radical varieties of features. We do not find the olive color of the Mongolian variety with the features of the Malay; nor the brown color of the Malay with the features of the Mongolian; nor the black skin of the Ethiopian variety, or the red color of the American, united with any set of features but those which characterize their respective varieties. It, however, by no means follows that the hypotheses of different races having been originally formed must be adopted, because climate is not adequate to the production of the radical varieties of complexion which are found among mankind. Man, as well as animals, has a propensity to form natural varieties; and the variations may in process of time involve all the tissues so as to yield permanent differences in color and quality of hair, color of skin, size

COMPLINE — COMPOSING-MACHINES

and form of bones, especially those of the skull and limbs. See EPIDERMIS; HISTOLOGY; MALPIGHI; RUYSCH.

Com'pline, the last or seventh of the daily canonical hours in the Roman Catholic breviary; the complement of the Vespers or evening office. St. Benedict, in the 6th century, added Compline to the hours, thus making the number seven, answering to the praises of which the psalmist speaks of "seven times a day." Matins and lauds were classed as one hour.

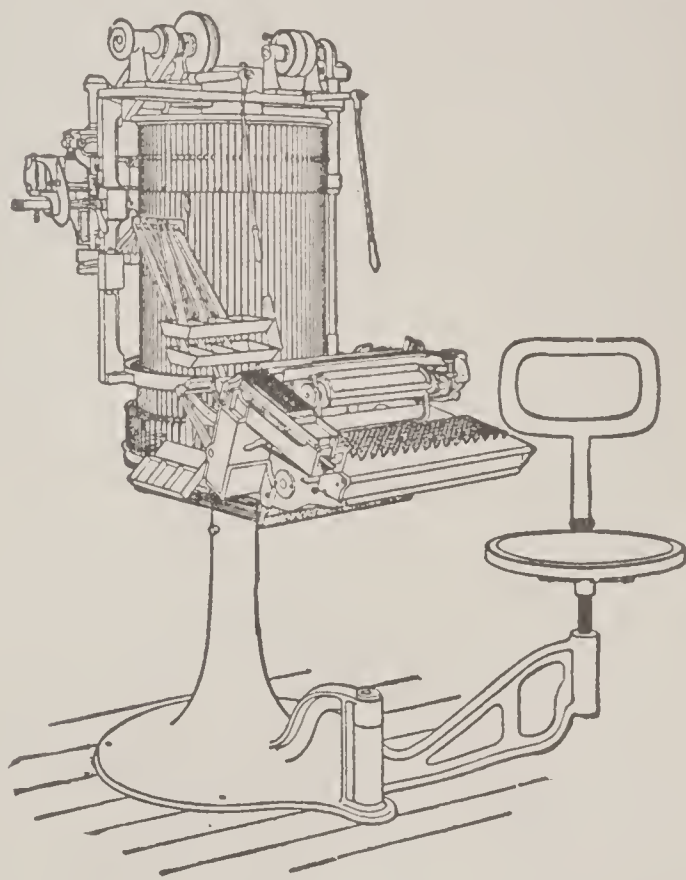
Complutensian (kōm-ploo-těn'sī-an) **Polyglot**, a polyglot made by seven scholars under the auspices and at the expense of Cardinal Ximenes. It was begun in 1502, and finished in 1517, but was not actually published till 1522. It consists of six folio volumes. In the Old Testament, on the left hand page, are the Hebrew original, the Latin Vulgate, and the Greek Septuagint; and on the right hand page, the Vulgate, the Septuagint, with Latin translation above, and the Hebrew, with primitives belonging to that language on the outer margin. At the lower part of the page are two columns used for a Chaldee paraphrase, and a Latin translation. The Greek Testament, constituting part of the Complutensian Polyglot, was the first complete edition of that part of Scripture printed.

Composing-machines, a general title for all classes of machines that compose or set either type or matrices, arranging them in lines and columns for printing. There are four prominent types of these: (1) Those that set matrices in line and cast therefrom a solid line or slug, as the linotype, monoline, and typograph; (2) those that cast and set type, as the monotype and graphotype; (3) those that set and distribute ordinary foundry type, these being the only ones properly styled type-setting machines, as the Simplex (modernized Thorne), Empire, Dow, Fraser, Kastenbein, etc.; and (4) those that impress male dies into soft material and cast lines from these impressions.

Historically, the type-setting machine comes first, William Church, of Connecticut, devising a machine which was patented in England in 1822, that was the first practical effort in this direction. He employed a keyboard, and stored the type in channels. From 1842 to 1872 there were 57 United States patents granted on composing machines, and from 1822 to 1872 a like number were patented in Great Britain. The most noteworthy of these were the Mitchell and the Alden machines in the United States, and the Kastenbein, Hattersley and Fraser machines in England. These machines all came into use during the period between 1853 and 1872, and a few may still be found in operation in England. The difficulty with all of them seems to have been that they required several persons to operate each machine, and that the consequent cost was very nearly the same as for composition by hand. From 1872 up to 1880 there were invented or constructed over 50 different machines designed to supersede the compositor, practically all of which failed of commercial success. During the period between 1880 and 1890 the Thorne type-setting machine, originating in Connecticut, came into considerable use, being employed by many newspapers throughout the United States,

and beginning to find a market abroad. During this period the Burr and McMillan machines also found some sale in the United States, and the Fraser, Hattersley, and Kastenbein in England and Germany. In 1898 the Thorne was remodeled and renamed the Simplex.

Of all the machines devised for setting foundry type, the Simplex is the best in use. The types are contained in 90 channels, set radially in the periphery of an upright cylinder. As the operator fingers the keys, the types called for are pushed out of the lower ends of the channels and carried around on a circular race-way to the point where they are brought into line. This line extends to a considerable length, without any reference to the length of line in which the matter set up is to appear finally. A second operator draws to him from the composed type thus emerging enough to form a line of the desired length. This he puts in the gal-



The Simplex.

ley and justifies, or spaces out to length, by hand. The leads, or spaces between lines, are also inserted by this operator.

After type set on the Simplex machine has been printed from, or molded for electrotyping, it is taken by a boy, who puts the type, a galley at a time, into a holder, which feeds it, a line at a time, into a short cylinder superimposed over the type-cylinder previously mentioned, from which it passes to the lower cylinder ready for composition again. Distribution and composition proceed simultaneously. Specially nicked type and combinations of wards or lips at the magazine entrances accomplish the distribution. The arrangements are such that the keyboard operator can also do the justifying (by hand), or two operators can be employed, as suits the convenience of the user. The Simplex machine has enjoyed a larger sale than any other composing-machine except the linotype.

The Empire machine, first known as the Burr, is a modification of the Kastenbein. It was produced in New York, and, like the Kastenbein machine, requires three operators. The distributor is a separate machine, that, when loaded with pages of type, separates them one

COMPOSING-MACHINES

by one and pushes them into the channels of a magazine. This magazine is placed on the top of the setting-machine, which is supplied with a keyboard. The operator releases the lower type from the channels by manipulating the keys, and the lines are justified by a second operator by hand. The builders of this machine have been for many years experimenting with an automatic justifying mechanism to do away with the labor of one operator.

The Kastenbein machine, which has had some sale in Europe, is very similar to the Empire, and does not require a separate description. Both employ nicked type in distributing.

The McMillan machine, developed in Ilion, N. Y., was provided with automatic justification, thus dispensing with the labor of one operator. When a line of type was composed, it was taken up automatically by a carrier and transferred to a point where the spaces between the words were exchanged for a size larger spaces; if the line was not then filled to measure, it was carried on to a third and a fourth stage, until large enough spaces were supplied to spread it to the width of the column. This justifying mechanism was very ingenious, but complicated, and only a few of the machines were built and sold. The distributor was a separate machine, operating quite simply at a speed of about 10,000 ems an hour.

The Cox type-setting machine attracted considerable notice in the printing trade in Chicago and New York in 1897. It was purchased by the Unitype Company of New York, manufacturers of the Simplex, or improved Thorne machine. The most unique feature of Cox's machine was the employment of crimped or corrugated spaces made of lead. The line was overset in length, and then squeezed down to measure by compressing the corrugations. This justification was satisfactory in some respects, but the crimped spaces created difficulty in many others, and its use was abandoned.

The Calendoli type-setting machine, developed in France by a priest of that name, has attracted much attention because of the wonderful claims made for its speed. Though exploited for several years, it has not yet (1905) been perfected for the market. It employs short types grooved so as to slide on rails, and the keyboard has numerous combinations to enable the operator to strike whole words or syllables at a single motion of the hand.

There was exhibited at the Pan-American Exposition in Buffalo, in 1901, a one-man type-setting machine that appeared to work successfully. It is the invention of Alexander Dow, and is the latest machine handling founders' type that is adapted to handle the several sizes in one machine. The justification or spacing out of the lines is entirely automatic, requiring no thought by the operator. The machine measures the line, calculates the proper size and number of spaces, and, discarding the dummy spaces inserted during the original setting, substitutes the proper sizes and pushes the type into the galley. It is in many respects a counterpart of the abandoned Paige machine. A distributor adapted to supply this machine has been constructed with a capacity for supplying three setting-machines.

Among other composing-machines that have been built in the United States, and attracted the attention of the printing trade at one time

or another, are the Converse, projected about 1894, which did good work, but was obstructed by previous patents; the Paige, on whose development nearly \$2,000,000 was spent, and which proved too costly to construct for the general market, the two machines built being now stored with Cornell and Columbia universities as mechanical curiosities; the St. John typobar, consisting of cold-pressed metal clamped on a steel base, to form a line; the Lagerman typotheter or Chadwick, a little machine for enabling a compositor to set type with both hands; the Johnson, which justified the lines by sawing a space of the required width; the composite type-bar machine, in which short, notched type were transformed into a line or type-bar by casting metal around their bases and between them; the Sears, in which dies were impressed in a block of wood, and a slug cast from the matrix thus formed; the Risley and Lake, in which the type were impressed in a soft sheet like blotting paper, and a stereotype taken after a quantity had been thus impressed, and the Heath matrix typograph, of the same class.

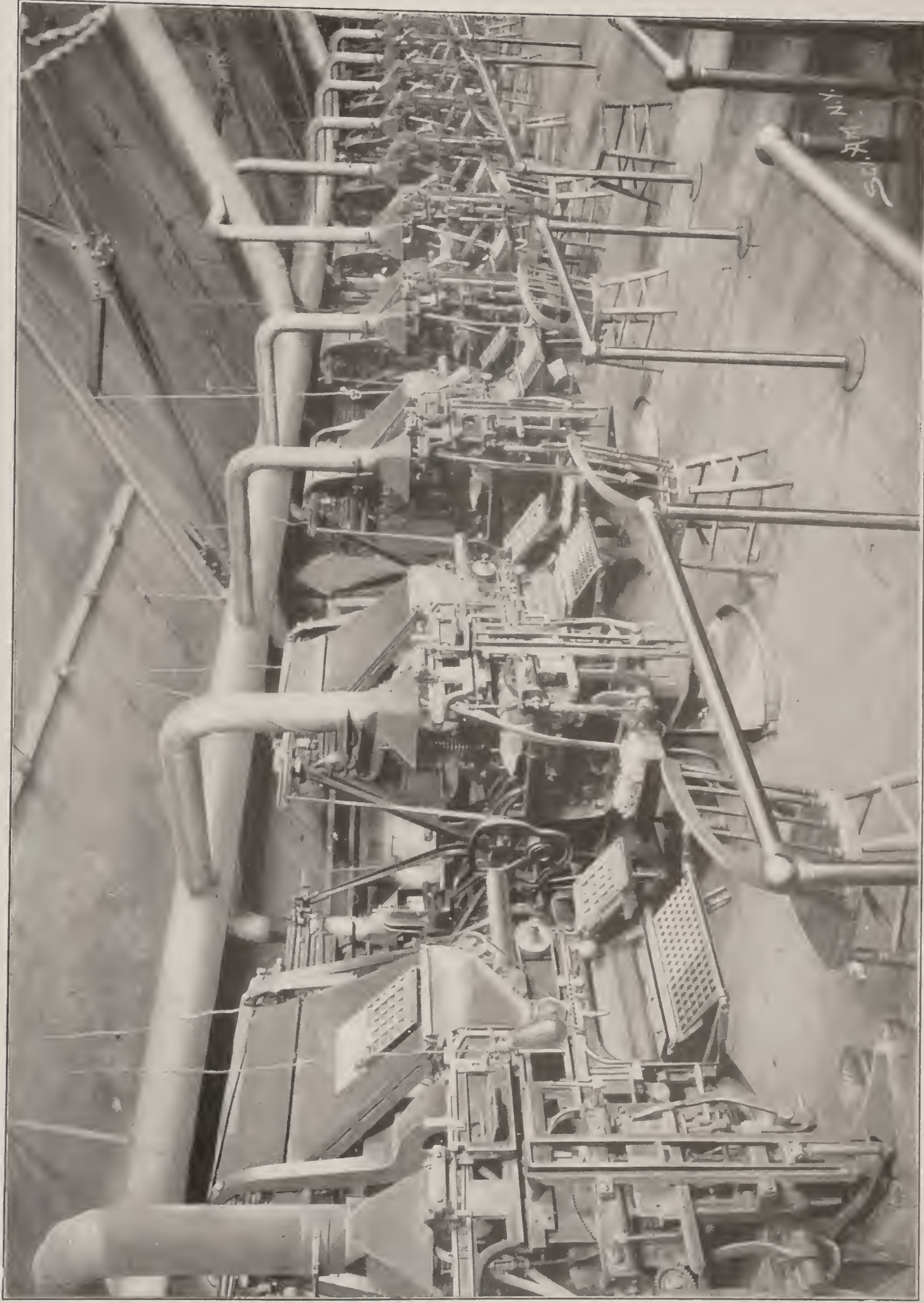
Many other type-setting machines might be mentioned that have been built and used somewhat, but practically all of them have been dropped by their owners, because automatic justification has not yet been practically achieved and the labor involved in operating them is much greater than with the linotype, which is a one-man machine,—that is, a machine delivering a full product with the labor of one operator. Many inventors have labored to produce a one-man type-setting machine handling single type, because such a machine is available for some purposes that a linotype machine is not. No such machine is yet on the market.

About 1890 the linotype became a commercial machine and began to take the market, and since that time has far outsold all others combined, there being at this writing (1905) about 10,000 in use as against probably 1,500 of all other makes.

The linotype is the invention of Ottmar Mergenthaler, who spent nearly 15 years of his life in Baltimore perfecting the machine which has largely revolutionized methods of type-setting. For a full description see LINOTYPE.

The Scudder monoline machine produces a slug like that of the linotype, and has been barred out of the United States as an infringing machine. It is being manufactured in Canada, and has been supplied to a considerable number of printing-offices there and in Europe. It is much smaller than the linotype and does a more restricted class of work. Twelve characters are carried on a single matrix, and the position as to height in the line determines which of the 12 shall be used. Eight kinds of matrices thus serve to give a total of 96 characters, and because there are so few matrices the mechanism for distributing them after using becomes very simple. The matrices have hooks on top which engage wires leading to their magazines, and readily slide back to position.

The Lanston monotype is the leading machine of the class that both casts and sets type. It employs first a keyboard, the operation of whose keys results in punching holes in a paper tape. The combinations of holes represent the different type characters. This tape is carried to a type-casting machine and fed in; as it passes

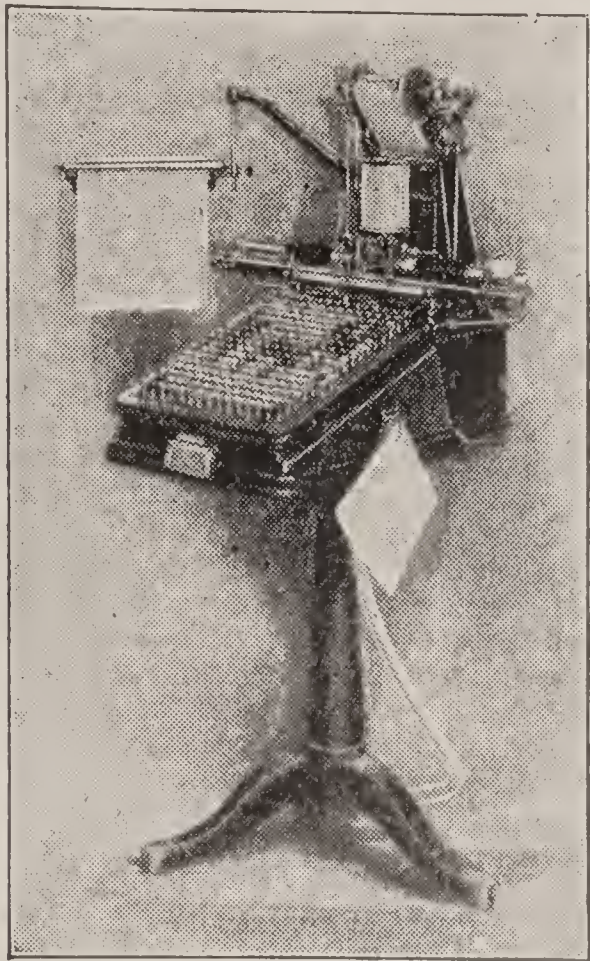


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BATTERY OF LINOTYPE COMPOSING MACHINES.

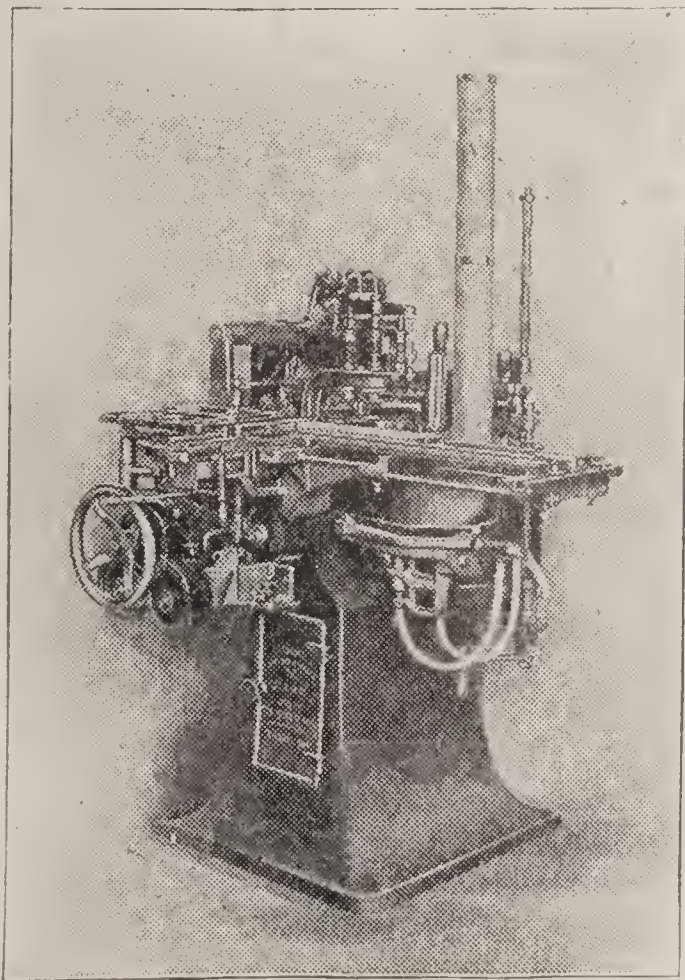
COMPOSITÆ

along, it controls the positioning of the dies before the mold, so that the characters are cast and assembled into lines and columns in the proper order for printing. The keyboard machine or



Lanston No. 1.

perforator is entirely separate from the casting mechanism. It includes 225 characters and a set of justifying-keys. The operator, having decided on the size and face of type and width of column, adjusts certain gauges and proceeds



Lanston No. 2.

to manipulate the keys. As he approaches the end of a line, a pointer on a dial indicates to him what justifying-keys he should strike to make the line of proper length. These perforations are made at the end of each line. Any errors made are repeated in the casting-machine,

and must be corrected later by hand. The product of his machine is a paper tape about two and a half inches wide, with rows of holes, each row representing a type character.

The tape is taken to a type-casting machine and fed in backward, so that the space casting arrangement is first adjusted before casting a line, so that the thickness of spaces required to justify that line accurately may be produced as required. The tape is fed in with a step-by-step motion and as each pair of holes is presented to the proper part of the machine, a blast of air which passes through the holes, serves to set in position the proper parts to produce whatever type character is called for. The casting-machine is automatic, but, being delicate and complicated, requires one attendant to two machines. The matrices are made separately, but are locked together in a frame that jumps from point to point, in order to bring the required letter to the face of the mold for casting. By changing the matrices and mold, any size or face of type within certain limitations can be produced from the one machine. A width of seven inches is also provided for, being the greatest on any composing-machine.

The Goodson graphotype machine operates on principles very similar to those of the monotype just described. Its mechanism is electrical, however, and both perforator and caster are much smaller machines. The number of characters on the keyboard is limited to 100, so that italics and small capitals cannot be produced with the full complement of other characters.

For further information on this subject consult: 'Wonders of Modern Mechanism,' 'The History of Composing Machines' and the files of 'The Inland Printer.'

JOHN S. THOMPSON,
Author of 'The History of Composing Machines.'

Compositæ (Lat. "compound," "put together"), a family of dicotyledonous plants, the greatest order in the vegetable kingdom, usually herbaceous in temperate and colder climates and shrubby in dry and hot regions, and seldom, apparently only in tropical zones, growing as trees. The leaves are never accompanied by stipules; they most commonly are alternately arranged, and sometimes opposite or whorled. But the true mark of the order is the compound flower, from which it gets its name and which makes it one of the simplest orders to identify, the daisy or aster being the commonest type and the name aster family or sun-flower family being sometimes used. The true blossom is a head made up of many florets, flat as in the aster or approaching a conical shape as in the black-eyed-susan. This head is set in an involucre of leafy bracts, which to the lay observer resemble petals and give the compound flower the appearance of a single bloom. The calyx, joined to the ovaries, crowns them, save in a few cases, with the pappus, which is usually hairy, toothed, or bristly, and coming to maturity at the time of fruition frequently furnishes the seed with a sort of wing facilitating dispersion by the wind. The corolla, tubular, ligulate or labiate, divides into five lobes at the summit. The anthers are united in a tube by which the five stamens are also joined into one. The ovules at fruition dry up and become

COMPOSITE ORDER—COMPOUND AMMONIAS

achenes (q.v.). Among the florets, which naturally fall into two classes, the fertile ones of the disk and the sterile ones of the ray, grow bracts called paleæ or chaff, except where the receptacle is naked. The classification of the order *Compositæ* is difficult, if for no other reason because it contains about 11,000 genera and more than 1,000 species, that is about one-tenth of the higher vegetable forms. The simplest division is into *Liguliflora*, with all florets ligulate or strap-shaped, and *Tubulifloræ*, with disk florets not ligulate. The latter class is by far the larger. The *Ligulifloræ* contains only the one tribe, *Cichoriæ*, of which the food-plants, lettuce, salsify, and chicory, are the best known members. In the other sub-order the *Tubulifloræ* are 12 tribes: *Vernoniæ*, with 41 genera, iron-weed being a common member; *Eupatoriæ*, with 35 genera, including the medicinal plants, ayapana, bitterbush, boneset and hemp agrimony; *Astereæ*, including the typical asters, dahlias, etc.; *Helianthæ*, with the artichokes and other tuberous plants; *Inuleæ*, of which elecampane may be mentioned as an example; *Heleniæ*, sneezeweed being an American member; *Anthemideæ*, including the different varieties of camomile, the chrysanthemum and the marguerite; *Senecionæ*, with four sub-tribes, and the old-fashioned foliage plant called dusty miller; *Calendulaceæ*, including the marigolds; *Arctotideæ*, with only one genus, occurring in South Africa and Australia; *Mutiseæ*, another scantily diffused tribe; and *Cynareæ*, including the thistles.

The *Compositæ* may be regarded, especially from a consideration of their flowers, as the highest order in a scale of vegetable evolution. Their peculiarly efficacious methods of pollination, this process being simplified by the close set florets which permit of insect-fertilization or wind pollination, and by a peculiar action of the style which in the individual flower pushes itself in the way of wind or insect. Dissemination also is highly developed, there being three prominent types, the plumose pappus, as in dandelion and thistle, which is wind-sown; the hooked achenes, as in the burdock and tickseed, which fastens to passing animals, and the gummy seeds of other plants, which are dispersal adaptations. On the order in general consult Bentham, 'On the Classification, History, and Geographical Distribution of the *Compositæ*' (1873).

Composite Order, a term denoting the last of the five orders of architecture. As its name implies, it is composed of two orders, the Corinthian and the Ionic. Its capital is a vase with two tiers of acanthus leaves, like the Corinthian; but, instead of stalks, the shoots appear small, and adhere to the vase, bending round toward the middle of the face of the capital; the vase is terminated by a fillet, over which is an astragal crowned by an ovolo. The volutes roll themselves over the ovolo, to meet the tops or the upper row of leaves, whereon they seem to rest. The corners of the abacus are supported by an acanthus leaf bent upward; and the abacus itself resembles that of the Corinthian capital. In detail, the Composite is richer than the Corinthian, but it is less light and delicate in its proportions. Its architrave has only two fasciæ, and the cornice varies from the Corinthian in having double modillions. The column is 10 diameters high. The principal ancient

examples of this order are the temple of Bacchus at Rome, the arch of Septimius Severus.

Composition, in Law, an agreement between debtor and creditor or creditors, by which the latter accepts part of the debt due in satisfaction of the whole.

Composition of Forces and Motions. See MECHANICS.

Com'post, any mixture of decomposed organic matter with earth, used as a fertilizing compound. They are most frequently made by alternating layers of sods and stable manure in piles three or four feet thick and sprinkling them with lime, kainit, and some potash salt, such as the sulphate or muriate. After several weeks, during which they are kept moist by applications of water or, better, liquid manure, they are cut with a spade and turned over to form a new heap in which the various substances are mixed as much as possible. They may be turned several times to insure the decay of the various organic materials. By varying the proportions of manure and fertilizer to soil and organic matter composts may be obtained suitable for various purposes; rich ones for succulent crops and less rich for plants that must be kept stocky. In a general way the term compost is also used for any heap of decaying vegetable or animal matter which is to be used as a manure. Thus stable manure and litter become compost heaps; also the piles of leaves, etc., from which leaf mold is obtained for greenhouse use. Directions for making composts for particular kinds of plants may be found in all books on gardening, floriculture, etc., and many of the works dealing with manures and manuring also devote space to composting.

Compostella, kōm-pōs-tā'la, **Order of St. James** of, an order of Spanish knights formed in the 12th century to protect the Christian pilgrims who had flocked in vast numbers to Santiago de Compostella, in Spain, where the relics of St. James the Great were preserved. At first there were but 13 members of the order, but it grew rapidly in numbers, and they became not only strong defenders of the relics of their patron, but defenders of Christianity against the invasion of the Moors. In time this order attained great wealth, thereby exciting the jealousy of the crown, which succeeded in securing the grand-mastership in 1522, after which the order rapidly declined.

Compound Alcohol, rectified spirits to which has been added one or more flavoring ingredients. They are called also compounds. The chief compounds are gin, British rum, British brandy, and some grades of American whiskey, cordials, and liqueurs, such as curaçao, lovage, cherry brandy, noyau, rum shrub, etc., are also denominated compounds. These are prepared by adding to clean rectified spirits various essences or oils, and sweetening with sugar or syrup. Sweetened compounds usually contain from 20 to 35 per cent of proof spirit.

Compound Ammonias, or **Amines**, a large and very important class of bodies derived from ammonia by replacement of the hydrogen with an organic radical. They are termed primary, secondary, or tertiary, according as one third, two thirds, or the whole of the hydrogen is replaced by an organic radical.

COMPOUND ANIMAL—COMPRESSED AIR

They are all basic in function, combining with acids to form crystalline salts. They have an alkaline reaction, and some are volatile and pungent. They are of great importance in the investigation of the constitution of various organic bodies.

Compound Animal. See COLONIAL ANIMALS.

Compound Steam-engine, a form of steam-engine originally patented by Hornblower in 1781, in which steam at a relatively greater pressure was allowed to expand in a small cylinder, and then, escaping into a larger cylinder, to expand itself against a larger piston. Compound engines are of two classes, which may be called compound and independent compound engines. The former are those in which the cylinders are near each other, and the pistons commence their respective strokes simultaneously, or nearly so, the steam expanding from one cylinder direct to the other through as small a passage as convenient. To this class belong most land engines, and the compound marine-engines with cranks at about 130° . See STEAM AND STEAM ENGINES.

Compounding a Felony, the act of accepting from a felon, by the person aggrieved, a return of the goods, a consideration, or a reward, on the express condition that he will not prosecute the felon. The mere failure to prosecute a person committing a crime is not, even if the goods are returned, compounding a felony; but the essence of the action is the agreement not to prosecute, for a consideration of any kind,—and the return of the goods is a sufficient consideration. The person aiding the felon is an accessory to the crime and can be prosecuted, although the person committing the crime has never been tried. In English law, to advertise a reward for the return of stolen goods renders the advertiser liable to a fine of \$250.

Compressed Air. Historical.—The use of compressed air as a power dates back to the beginnings of recorded history. Leaving out of the question the use of wind power for the propulsion of vessels, air compressed in some degree must have been used in the earliest ages. The reduction of metals from their ores antedates the Christian Era by thousands of years; and the blast furnace in primitive form was the basis of this process. Some of these crude devices are in use to-day among savage tribes, doubtless little changed from the forms used centuries ago when mankind was young. Among them may be mentioned the wind-bag trodden by the feet, and the wooden cylinder and piston.

On the sculptured and painted walls of the oldest civilizations appear figures indicating the use of air under pressure for some of the processes of those times. The bellows in some form is doubtless the original of modern air compressors, and it may have had a place at the fireside of primeval homes.

Among the earliest records of the use of compressed air must be placed the 'Spiritualia' of Heron of Alexandria. The notes of this old philosopher show conclusively that the use of compressed air in a pump was familiar to the scientists (so-called) of those days. Heron himself—or Hero—must have had some means of producing air pressures higher than those furnished by the bellows, in operating the well-known "Hero's Fountain."

There is no doubt that many of the "supernatural" phenomena with which the priests of ancient Egypt awed the credulous people were the results of air pressure secretly applied. The vocal statue of Memnon at Thebes owed its divine powers to the expansion and contraction of air under heat and cold. The famous moving statue of the god Serapis was operated by crude pneumatic devices. Much of the famous altar magic of the priesthood was the effect of compressed air action. For instance, the automatic opening of the temple doors when the altar fire was kindled was caused by the expansion of air in a closed chamber under the heat of the fire. As early as 350 B.C., the diving bell in primitive form was in use. It is mentioned by writers of that period as known to the Greeks and Phœnicians. Heron knew of a means of compressing air by the fall of water in a tube and Pliny mentions the use of this early precursor of the modern hydraulic compressor.

Coming to a later date, the "wind guns" of Ctesibius of Alexandria, 120 B.C., prove the existence of some means of securing a pressure high enough for the discharge of projectiles. This is the only instance in ancient history of what may be called "high pressure" compression.

Compressed air seems then to have been lost in the darkness of the early Christian Era and the Middle Ages. Then the diving bell appears again in Spain and is mentioned in the writings of Bacon. A little later Halley in England introduced the submarine diving armor and Smeaton and Brunel, about 1780, used compressors for supplying fresh air to the diver. In 1600 and 1656 the pneumatic gun reappeared in France and Germany.

Von Guericke of Nuremburg introduced improvements in vacuum pumps and air compressors. The development of the iron industry brought about improvements in blowers for blast furnaces. About 1653 the first attempt was made by Papin to transmit power by compressed air. His original scheme contemplated the compression of air in a pump driven by water wheels and its use in a tube for transmission to a distance. His attempts failed for lack of a correct understanding of the physical properties of air. This same inventor experimented with a parcel delivery in pneumatic tubes.

In the last years of the 18th century and the early part of the 19th, Medhurst in England experimented along general pneumatic lines. He succeeded in attaining pressures above 200 lbs.; he transmitted these pressures and applied them in a motor; he developed a pneumatic despatch system for parcels and persons; and he otherwise contributed to compressed air development. His was the first pneumatic automobile, brought out in 1800. Wright in England a little later used air storage tanks on cars with air motors and applied a reheater to increase the expansive force. He also produced the first crude air brake, with an axle-driven compressor for furnishing pressure.

Compressed air as a distinct and accepted branch of engineering may be said to date from the first of the 19th century. Its safety, adaptability and general utility then began to be recognized and the great variety of the uses to which it was applied foreshadowed its countless applications to-day. Compressed air locomotives and pneumatic motor-carriages were built and operated. Pneumatic tube systems were developed

COMPRESSED AIR

and achieved a practical success in London in 1845. Dr. Gorrie, in New Orleans, built the first refrigerating plant, in 1850, and the modern systems of refrigeration by expansion of compressed gases follow the lines laid down by him.

The development of the air compressor was slow and spasmodic. Mann, in 1829, first suggested and patented a system of stage or compound compression in several cylinders with intercooling. But the tremendous importance of this system was not realized and it lay dormant for almost half a century. The *trompe*, or primitive water compressor, was in use as late as 1870, but it was not economical. Only in recent years has this principle in modified form received a degree of recognition in the hydraulic compressors of Taylor. The great Alpine tunnels—Mont Cenis and St. Gothard—brought compressed air appliances into prominence in the early seventies. On the former tunnel Sommeiller used hydraulic compressors. Later developments brought water-piston compressors, with jets or sprays for cooling. Pneumatic haulage locomotives were used in driving these mountain bores. Present practice is largely based on the experiences of these Alpine pioneers. They paved the way for the high grade compressors of to-day.

The Hoosac Tunnel in America first brought the pneumatic rock drill to the front; and since that time this epoch-making device has enjoyed a constant development under the genius of Burleigh, Ingersoll, Sergeant, Rand, and others, who have brought the rock drill to its present perfection.

The current records of the Patent Office show countless pneumatic appliances. But modern improvements are in matters of detail. Basic principles are established and the developments now in progress look toward greater perfection in design and construction, greater economy, and increased power and reliability. Compressed air is to-day recognized as an economic necessity. There is hardly a field of industrial activity in which air power in some form is not used. The importance of the position of compressed air in modern economics will be best appreciated by an investigation of succeeding pages, devoted to a discussion of air power appliances as they stand to-day. In their present forms they approach the limit of economic refinement.

Air Compression.—Pneumatic engineering, in its relation to air compression, rests fundamentally upon the two primary laws of gases. These laws may be stated here and their application will appear in the discussion following.

The first law of gases, known as Boyle's or Marriotte's Law, states that when its temperature is maintained constant, the volume of a gas varies inversely as its pressure; or, at constant temperature, the product of pressure and volume is a constant. This law is expressed thus:

$$P_1 V_1 = P_2 V_2 = P_3 V_3 = K.$$

K is a constant, having different values for different gases. Regnault, by use of instruments of greatest precision, proved that Boyle's Law is not absolutely correct. But the discrepancies are noted only at the very highest pressures and for practical purposes may be ignored.

The second law of gases is known as Charles'

or Gay-Lussac's Law and states that at a constant pressure, the volume of a gas is proportional to its absolute temperature. In another form more applicable to practical use, the law says that at a constant volume, the pressure of a gas is proportional to its absolute temperature. Its algebraic expression is:

$$V_1 (T_2 + 459.2) = V_2 (T_1 + 459.2).$$

The constant 459.2 is the absolute zero Fahrenheit.

Where conditions are such that pressure, volume, and temperature are all variables, the relations are algebraically expressed thus:

$$P_1 V_1 (T_2 + 459.2) = P_2 V_2 (T_1 + 459.2).$$

This expression combines Boyle's and Gay-Lussac's Laws and covers the conditions of practical air compression. For in practice all three quantities—pressure, volume, and temperature—vary at different stages of the compression process.

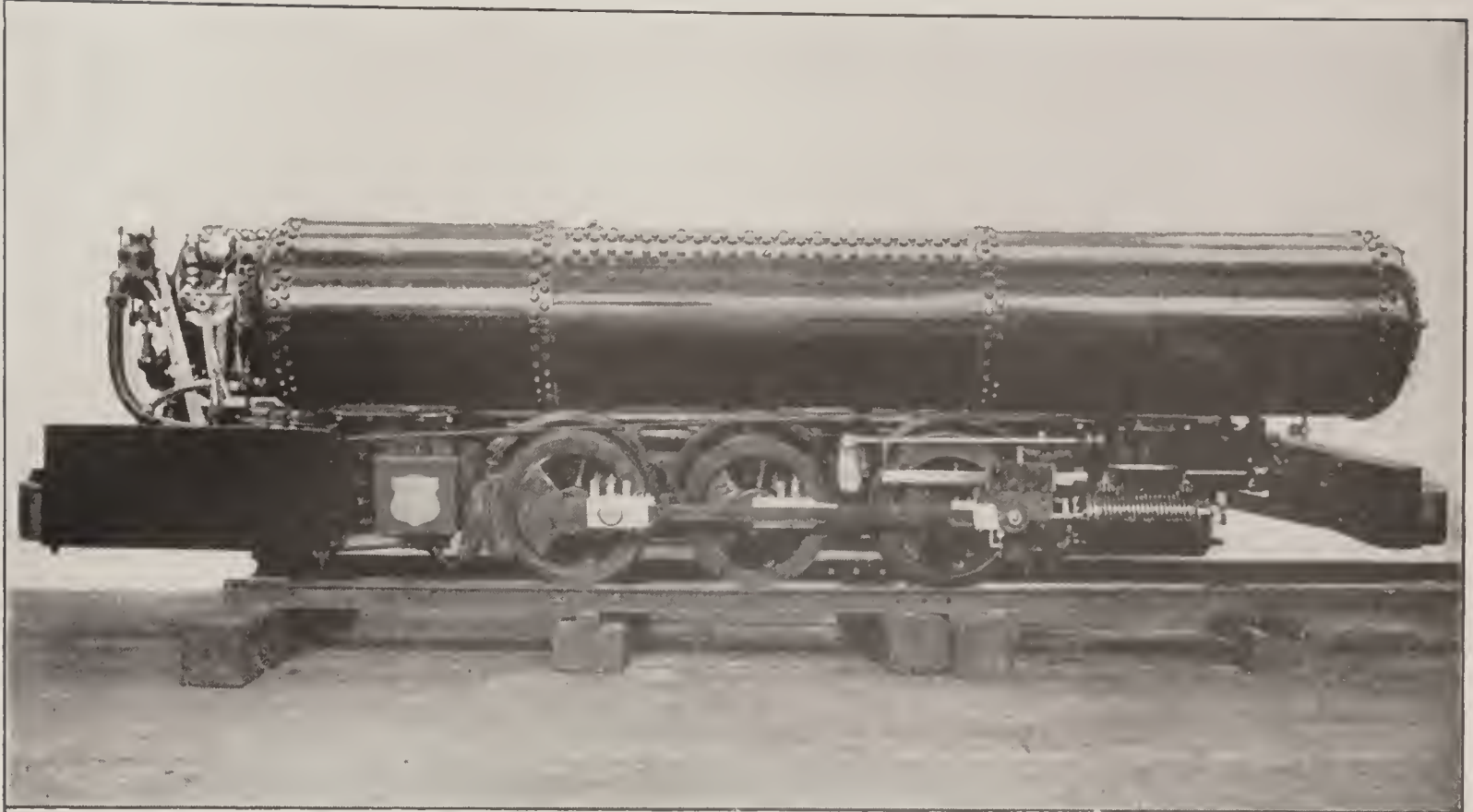
Whenever air or any gas is compressed, there is an increase in its temperature; and this is true whatever the rate or speed of compression. This phenomenon is the result of an increased molecular activity in the air due to its increased density and manifested in the form of sensible heat. The temperature attained is a function of the degree of compression and is greatest in the early stages, diminishing as higher pressures are approached. This heat of compression has been the stumbling block of compressor designers and their principal efforts have been toward the elimination of the evils it produces.

Isothermal compression is the ideal of pneumatic engineers, but in practise it is never realized. Theoretically, it is a process in which the heat of compression is removed as fast as produced. It is the exemplification of Boyle's Law, in the expression of which— $P_1 V_1 = P_2 V_2 = K$ —the temperature T is not a factor. While the best air compressors of to-day closely approximate its values, it cannot be wholly attained, for there is no perfect cooling device known.

Adiabatic compression is that in which none of the heat of compression is removed. It embodies a combination of Boyle's and Gay-Lussac's Laws, involving the three variables of pressure, temperature, and volume. Its algebraic equation has already been given, under the second law of gases. Adiabatic compression can never be fully realized, since there is always some conduction and radiation of heat by the materials of the compressing mechanism.

Were it possible to compress a volume of air strictly according to Boyle's Law—*i.e.*, isothermally—it is evident that when the original pressure had been doubled, the original volume would have been reduced exactly one half. But in practise it is found that when the pressure has been doubled, the volume has not been reduced one half, and the temperature is very much increased. If now the process of compression be stopped and the temperature of the air allowed to drop to its original value, the volume remains the same but the pressure is found to have fallen to less than twice the original. To reach the required pressure of twice the initial, compression must be carried still further, with another manifestation of heat. A consideration of these facts shows plainly that a part of the work of compression was expended in producing an increased temperature

COMPRESSED AIR LOCOMOTIVES.



COMPRESSED AIR MINE LOCOMOTIVE.



COMPRESSED AIR INDUSTRIAL LOCOMOTIVE FOR SURFACE USE.

COMPRESSED AIR

which, acting momentarily according to Gay-Lussac's Law, increased the pressure of the air volume. But this added pressure was an unstable quantity, disappearing as the air cooled; and it is evident that the energy applied in producing this "heat increment" of pressure was, for all practical purposes, wholly lost. In other words, more power is required to produce a given volume at a given pressure *when the air is allowed to heat itself*, than would be necessary if the air could be *kept cool* throughout compression. In the first case, we have adiabatic compression; in the second, isothermal. This, in brief, is an explanation of the phenomena and the problems which have confronted the designers of the modern air compressor.

Evidently the solution of the thermo-dynamic problems outlined above lies in the removal of the heat of compression before it can have any effect on the air volume. It is impossible to do this with complete success; but two methods or systems have come into almost universal adoption which, in combination, attain the nearest approach to complete cooling.

The first of these is jacket-cooling, in which the compressing cylinder is surrounded as completely as possible with cold water, which carries off the heat conducted from the air through the cylinder walls. The system is useful but not sufficient; first, because only the external film of air is in contact with the cold cylinder walls and, air being a poor heat conductor, none of the heat from the interior volume reaches the surface; second, as the piston advances, the area of cold cylinder walls exposed in front of it constantly diminishes, and when the highest temperature is reached near the end of the stroke, there is practically no cooling surface available. In the best compressors this second defect is improved, but not wholly corrected, by jacketing the cylinder heads as well as walls. Jacket cooling, while not adequate, is useful in keeping the compressor cool and improving lubricating conditions.

The second system of cooling is that of stage compression. Here there are two or more cylinders (according to the final pressure required), in the first of which a moderate pressure and temperature is reached, and from which the air is discharged to an intercooler, where it is reduced by contact with water-cooled surfaces to almost water temperature. It then enters the second cylinder *cool*, and is compressed still further and then again cooled; and so on, until the terminal pressure sought is attained. The best modern practise advocates single-stage compression, or compression in one cylinder, for pressures up to 70 lbs. gauge; for pressures of 75 to 500 lbs., two and possibly three stages; for pressures above 500 lbs., three and four stages. Most of the success of stage compression depends upon the efficiency of the intercooler. The three essentials of a good intercooler are: first, ample cooling area; second, complete subdivision of the air into thin sheets or streams, giving intimate contact with the cold surfaces and dissipating internal heat; third, large capacity, that the air in passing may have a low velocity and long contact under cooling effect.

A third system of cooling was tried in the early days of pneumatics—the injection of water in a spray into the compressing cylinder

in front of the piston. But it was found in practise to introduce difficulties more than counterbalancing its advantages, and it was finally abandoned. Still another early system involved the use of a water column as a piston, but it, too, was ineffective and failed.

Modern single-stage air compressors (simple or duplex) have as complete water-jacketing as possible, depending entirely upon this means for the removal of heat. In the best machines the valves are arranged to permit head as well as barrel jacketing. Multi-stage compressors (two, three, and four cylinders) have complete jacketing as well as thorough intercooling. In advanced types for very high pressures the last two or three cylinders are completely submerged—cylinders, heads, and valves—in a box filled with circulating cold water.

The driving or power ends, valve movements (both steam and air), and mechanical construction of air compressors of to-day embody the best engineering practise. An intelligent and liberal application of metal provides a structure adequate to all strains. Correct design, high-grade materials and first-class workmanship give a very high degree of economy in the best machines. The actual details of design and construction cannot be entered into here, but a good understanding of their development in the best practise will be gained from the discussions of standard machines of representative makers, in subsequent pages. Suffice it to say that the modern air compressor, as an efficient converter of energy, stands high in the scale of economical and mechanical refinement, and represents a splendid combination of correct theory and practise.

Air Expansion.—The fundamental principles of air expansion are contained in Boyle's and Gay-Lussac's Laws, as stated in the section on air compression. The same algebraic expressions indicate the relations of temperature, pressure, and volume in both air compression and air expansion. In fact, the phenomena of air expansion and application in air motors may best be understood by considering expansion as in the nature of a negative compression process.

Isothermal expansion is expansion at constant temperature; no heat is lost. Adiabatic expansion is expansion with the complete proportionate loss of heat; it can never be fully realized in practise, since heat is always present and will be absorbed in some degree. In air expansion, as in air compression, isothermal action is an impossible ideal, which can only be approximated in the best air motors.

It has been seen that, if an amount of air at a given temperature could be compressed isothermally to one half its original volume, the pressure produced would be twice the original. Assume, for the moment, that this ideal condition had been attained in a *perfect* machine, *i.e.*, one in which there was no mechanical absorption of energy, no leakage, no loss. Now, if this diminished volume of air were allowed to expand isothermally, it would return to exactly initial pressure and its original volume. This would be a perfect cycle of compression and expansion, and the exact equivalent of the work expended would be recovered. But isothermal expansion is impossible. Still assuming a perfect machine, the actual result will be that the original volume will not be reached on expan-

COMPRESSED AIR

sion to initial pressure. For this expansion of the air causes a drop in its temperature, due to the reversal of the molecular action which, in compression, gives rise to heat. This reduced temperature, according to Gay-Lussac's Law, reduces the volume of the air at the original pressure. Or, putting it differently, this diminished temperature acting with the expansion, produces the initial pressure before the original volume has been recovered.

In air compression and expansion along adiabatic lines, there is a double loss as compared to isothermal; due, in compression, to the positive heat increment of work referred to in the previous section, and in expansion, to the negative heat increment which, it has already been seen, is simply the result of a reversal of the molecular action. Adiabatic compression gives an abnormal increase of temperature and pressure; adiabatic expansion results in an abnormal reduction of the same quantities.

It has been shown that, in air compression, this resultant loss can be reduced, but not wholly avoided, by removing the heat of compression as produced, with suitable cooling devices. So, in air expansion the loss may be diminished by "removing the cold"—in other words, by heating the air during expansion.

It is manifestly impossible in practise to heat the air in the cylinder *during* the actual process of expansion. But if the temperature be raised in suitable degree before the air enters the engine cylinder, an excess initial pressure will be obtained which will bring the terminal expanded volume to normal value at normal pressure. In such case there is not a direct, positive gain—rather, simply an avoidance of the loss otherwise inherent. But reheating—as this process of heating the air is technically called—is capable of far more than this; it is possible, by heating to a still higher degree, to effect an actual and large gain of power. According to Gay-Lussac's Law, this heating will save air at a given pressure, since the volume is proportional to the temperature. Or, the volume remaining constant, heating will increase the pressure in proportion to the temperature reached. In either case there is a direct increase in the available energy of a given volume of air; and it is possible to make use of this surplus energy, with a positive gain.

Single-cylinder or duplex air engines must rely for economy on pre-heating—heating before expansion. But compound or multi-cylinder air engines, such as are sometimes used on pumps, effect an exact reversal of "stage compression" and intercooling in "stage expansion" and inter-heating. In this case the air is heated *before* entering the cylinders, the discharge from one cylinder, after being heated, being delivered to another and larger cylinder where it does further work at a lower pressure. Coal or other combustible, used in reheating under such conditions, gives a power equivalent from four to six times that which it will yield in a boiler and steam engine of most refined economy.

Aside from all considerations of economy, it is practically impossible to use compressed air expansively in an engine, without reheating. The cold produced by expansion of air at atmospheric temperature freezes the moisture in the air and clogs the engine. But reheated air

can be used with a very short cut-off; and even though the initial temperature may be excessive, the mean cylinder temperature is wholly practicable and high economy can be secured, without lubrication difficulties and without freezing up.

Air engines, or air motors, are used for a variety of purposes and there is a marked tendency toward their greater adoption in larger units for hoists, pumps, and similar work where air power is available. They differ from the best steam engines only in their cylinder clearance, which is kept as small as mechanical considerations permit, for greater air economy. Their most common use is in the small rotary pneumatic tools, but, with proper reheaters, there is no reason why they should not find a prominent place in larger sizes for industrial work. In fact, it may be said that the greatest strides in the future development of compressed air as an industrial power will be along the lines of expansive working as made possible by practical reheaters. The irresistible tendency of the age is toward higher economy; and the air power plant of the future will depend for its economy largely on the efficiency of the air reheaters employed.

Air Transmission.—The theory of transmission of air power by the flow of compressed air through pipes may be dismissed with only a brief mention. Speaking generally, the laws of flow of gases hold in relation to compressed air.

Usually the air is delivered to the pipe line at the temperature of discharge from the compressor cylinder. But there is an increasing tendency toward the use of aftercoolers in large air plants, for the purpose of eliminating the entrained moisture from the air by condensation before it enters the pipe line. The object of this is two-fold; first, to prevent the accumulation of water in the pipe lines, with consequent reductions of pipe cross-section and increase of frictional resistance; second, to assure the delivery of dry air to the air motors. The air aftercooler is similar in design to the intercooler; cooling is secured by subdivision and intimate contact with metallic surfaces cooled by a continuous flow of cold water. A drain is provided for the removal of precipitated moisture.

Where no aftercooler is used and the heated discharge air enters the pipe line direct, the heat is soon dissipated by conduction and radiation, and after that the transmission is isothermal, *i.e.*, at constant temperature. This loss of heat, by Gay-Lussac's Law, produces an initial drop in pipe line pressure. But after that, loss of pressure in transmission is due wholly to frictional causes (assuming there is no leakage), and varies directly with the length of the pipe line and the square (for moderate velocities only) of the velocity of flow, and inversely with the diameter of the pipe. Expressed algebraically, this relation is

$$D_p \text{ (drop in pressure)} = C \frac{V^2 L}{d}$$

V being the velocity of flow, L the length of the line, d the diameter of the pipe, and C a constant depending upon the physical properties of the transmission line (condition of interior walls, number and angle of bends, etc.).

Space cannot be taken here for an extended

COMPROMISE OF 1820—COMPROMISE OF 1833

discussion of transmission formulæ, involving values of pressure, temperature, volume, cross-section and length, to say nothing of the variable physical factors in the pipe line itself. For investigations on these lines, reference must be made to specialized technical publications. It may be said here that each transmission involves its own peculiar problems, and even the best formulæ give only approximations to actual performance.

It is worthy of note here, however, that drop in line pressure due to any causes other than leakage does not mean a total loss. For the reduced pressure results in an increased volume; and by the use of reheaters this pressure may be restored, wholly or in part, and the apparent lost power restored to the system. In this very fact lies the paramount superiority of compressed air transmission over all other modes of power transmission.

Air receivers are an essential part of a compressed air transmission or distribution system. There cannot be too many of them, nor can their capacity be too large. The compressor discharge is essentially pulsating in character. The receivers take up and absorb these pulsations and assure a steady, uninterrupted flow over the system. Furthermore, there will be an accumulation of energy in these receivers, which can be drawn upon in emergencies of excess demand. Large receiver capacity in an air power system acts as a balance wheel, equalizing supply and demand, and smoothing down the load curve. Every receiver, moreover, is in a sense a cooler and will collect a certain amount of condensed moisture, thus adding to the dry quality of the air.

Briefly, the essentials of a correct and efficient air power transmission system are: effective aftercoolers close to the compressor discharge and properly drained; a pipe line of ample cross-section, laid with wide-angle bends and as few valves as possible, with the pipe interior clean and free from obstructions, with all low points properly drained, with proper provision for expansion and contraction, and, *above all*, free from leaks; and ample receiver capacity, in units distributed throughout the system, all properly drained. See AIR COMPRESSORS; PNEUMATIC TOOLS; PNEUMATIC TUBES; POWER, TRANSMISSION OF; POWER, UTILIZATION OF; MINES AND MINING; MINING AND MILLING MACHINERY; COAL MINING MACHINERY; AIR BRAKE; AIR PUMP; PUMPS AND PUMPING MACHINERY.

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Compromise of 1820, in American political history, a national law enacted by Congress 6 March 1820. In 1819 the territory of Missouri, with a population of 60,000, demanded admission into the Union as a slave State. Arkansas was preparing to make similar demands. Such action would have given the South the balance of power in Congress, and the North made this a national issue. The North controlled the House of Representatives, while the South controlled the Senate. A deadlock was inevitable, and a party of compromise sprang up, which succeeded in producing a temporary arrangement acceptable to both parties. This was the compromise of 1820. It divided the Louisiana

Purchase between freedom and slavery by a line drawn at 36° 30' N. lat. See UNITED STATES—ABOLITION AND THE FREE SOIL MOVEMENT.

Compromise of 1833. This was Henry Clay's tariff compromise, to prevent Civil War on account of nullification by South Carolina. The tariff of 1828 was regarded by the South as very injurious and inequitable, raising its expenses and reducing its income, and laying burdens upon it without compensating advantages. The tariff was borne in the hope that Jackson, a southern man, would throw his influence against it, but when he signed the amended act of 1832, leaving the duties much as they were, South Carolina took the lead in revolt. On 19 Nov. 1832, a convention called by its legislature, declared the act of 1828 and its amendments null and void, forbade its enforcement in the State or appeal to the supreme court regarding it, and decreed secession in case the United States should attempt to use force. On 4 Dec. 1832, Jackson's annual message mildly criticised the tariff as overgrown and needing gradual retrenchment to a revenue basis, and apologized for the popular resistance, which he thought the laws adequate to suppress. The nullifiers and their opponents alike thought he had surrendered to the former as in the Cherokee case (see CHEROKEE NATION *v.* GEORGIA); but on the 10th, apparently from a sudden shift of emotional feeling, he issued a powerful proclamation against them, characterizing nullification as an absurdity "incompatible with the existence of the Union," and declaring that it would be resisted by the entire national force. There was great enthusiasm throughout the North, and general approval even in the South, but South Carolina returned a defiant counter-proclamation, and Calhoun resigned the vice-presidency, to be immediately returned to the Senate as the champion of nullification. To remove the grievance the House Committee of Ways and Means on the 27th reported the Verplanck Bill, reducing the tariff within two years to the standard of 1816, the primitive basis. But the President, angered by the new South Carolina threat, asked for a bill to enforce the law by military power, and extend Federal jurisdiction over revenue cases—called by the people the Force Bill, and by the South Carolinians the "Bloody Bill." All parties were perplexed and unable to act. South Carolina had relied on Southern support, which was not forthcoming; the House could not agree on the Verplanck Bill nor the Senate on the Force Bill. On 12 February, 20 days before final adjournment of the 22d Congress, Clay undertook a compromise. He introduced a bill into the Senate which reduced the duties to a general 20 per cent by a sliding scale to end in 1842, enlarged the free list, etc. Clay's assigned motive was, that without some such measure the protective system was likely to be abolished altogether, but not before there had been civil war, in which the South would not let South Carolina stand alone. A further motive was, that he dreaded to see Jackson made a virtual dictator with a large army in his hands, as none could tell what he might do with it. Calhoun, to men's great surprise, struck hands with Clay, though the pending Verplanck Bill was a far greater relief to the South. But Calhoun was far more anxious for a triumph of nullification, and the consequent mastery by the

COMPROMISE OF 1850

South of her own destinies, than for mere lightening of material burdens, and the compromise bill would be notoriously a concession wrung from the North by the threat of nullification, while the Verplanck Bill, even if passed (which was dubious), would be only a bill like another. The compromise bill was referred to a select committee with Clay for chairman. The manufacturers' lobby insisted on amendments, of which the chief was very obnoxious to the South—that for computing *ad valorem* duties on the basis of valuation at the home ports. As they made this an ultimatum, Clay supported it in the Senate, while Calhoun denounced it as both oppressive to the South and unconstitutional. Finally Clayton of Delaware, a strong Protectionist, threatened for his party to lay the whole on the table unless the Calhounists and their leader voted for the amendment, which they did. Meantime the Force Bill had passed the Senate; and Clay urged it to pass the compromise tariff bill also, so that the bill for violence should have that for harmony to counteract it. The objection was raised that the bill was one to raise revenue, and could not originate in the Senate. This was met by the shrewd device of moving the House to strike out all but the enacting clause of the Verplanck Bill and substitute Clay's bill, and send it to the Senate for concurrence—which it did the next day, 119 to 85, and the Senate adopted it, 29 to 16. South Carolina, which had appointed 1 February for the nullification ordinance to go into effect, repealed it, and the country hailed it as a great deliverance. Clay himself later confessed, however, that he doubted whether he had done wisely. The nullifiers denied that they had abandoned a jot of their contention; hailed the result as a proof that it was the only means by which the South could obtain justice; and professed to have postponed the date of its operation only out of friendship to Virginia, which sent a commissioner to deprecate it. It is certain that the South won both the material and the moral fruits of the victory. Consult Schurz, 'Life of Henry Clay,' Vol. II., chap. xiv.; also other lives of Clay, and biographies of Jackson and Calhoun.

Compromise of 1850. The Missouri Compromise of 1820 (q.v.) had divided the Louisiana Purchase between free and slave territory at 36° 30' (the general boundary between Arkansas and Missouri), except that Missouri was to be slave. The extreme pro-slavery members, about one fifth of the House and one fourth of the Senate, based their opposition on the ground that Congress had no power to legislate on slaveholding in the Territories, it being a fundamental right implied in the Constitution; but the majority admitted the jurisdiction by passing the bill. The joint resolution for admitting Texas in 1845 extended the same line to any new bodies formed out of that State; and was supported by the most ultra slavery men, as taking the merest sliver from them and securing solidly the enormous remainder. When the Mexican war seemed likely to add new territory, the Wilmot Proviso (q.v.) of 8 Aug. 1846, attempted to bar slaveholding from it, as did existing Mexican law; and the struggle to prevent this transformed political parties. After the annexation had taken place, 2 Feb. 1848, bills for organizing the Territories of New Mexico and

California were introduced: at first in an omnibus bill with Oregon (the Clayton Compromise), to force all of them to permit slaveholding, then to extend the Missouri compromise line to the Pacific (including in slave territory nearly all the present New Mexico and Arizona, and the entire southern half of California); then the Democratic Senate receded from the Oregon "hold-up," and the House repeatedly attempted to organize the other bodies as territories with the proviso; while the Senate regularly killed the bills, and once attempted to attach its own as rider to an appropriation bill. This went on till the end of 1849, when the gold discoveries in California forced the hand of both the Southern slavery party and its Northern allies. The immense immigrant population there formed a constitution prohibiting slavery, and demanded admission of California as a State. Even the deniers of the right of Congress to legislate on slavery had always admitted that the people of a State had the right to live under any constitution they pleased; and the Democrats, to hold their vote in North and South, now took the position that the inhabitants of an inchoate State should be allowed to decide their own destinies. As this meant the immediate reinforcement and ultimate supremacy of the free States, the Southern Whigs and Democrats began to draw together, and formulated the doctrine that the people of a Territory had no right to exclude the industrial or social system of any part of the Union; that Congress should force them to rescind such exclusion if made; and that the exclusion, if permitted, was a wrong which justified secession. But California was not a Territory: it was a body of unorganized settlers who would come in as a State from the first, and certainly could be admitted by Congress on their own terms. The Southern leaders, therefore, resolved that they should not be admitted except by passing through the territorial stage, so as to come under the congressional prohibition. Zachary Taylor, a slaveholder, but a moderate and just-minded man, had been inaugurated as President in March 1849, and his first congress met in December. The Senate had a large Democratic majority; the House was so evenly divided that the few Free-Soilers held the balance, and it required 63 ballots and three weeks to elect a speaker, Howell Cobb of Georgia. On their meeting Taylor had sent a message recommending California's wish to become a State, to their favorable consideration; on 21 Jan. 1850, he sent a special message, declaring that the people would not sustain them in denying the Californians the right of self-government. The South, nevertheless, was passionately determined not to yield; and Henry Clay undertook one of the great compromises which were the pride of his life, the shortest-lived and most destructive compromise in American history. The difficulty was to find anything that either side wanted badly enough to take as a price for yielding. For the South, this was found in the Fugitive Slave Law (q.v.), which Alexander H. Stephens declared to be the very essence and heart of the whole compromise, and the breach of which by the Northern personal-liberty laws was accounted the crowning justification of secession; and in a money indemnity to Texas for abandoning her claim to the Rio Grande as a western boundary, which that State was ready to fight for, but the payment for

COMPROMISES OF THE CONSTITUTION — COMPTON

which would raise the market value of her bonds, largely held in the South. For the North, it was found in the admission of California as a free State, and the prohibition of the slave-trade in the District of Columbia—the latter a mere sop, as slavery was not abolished in the District. The sacrifices were, that the South gave up the right of insisting that no free State should be admitted into the Union except as paired with a slave State, and so in her own view gave the North the fruits of the Mexican war; the North gave up the proviso, and the right of stopping the interstate slave trade, though this was later stricken out. On 16 January a bill had been brought into the Senate to organize "the Territories of California, Deseret [Utah], and New Mexico"; on the 29th Clay unfolded his compromise, in eight resolutions: (1) admitting California with her free-State Constitution; (2) organizing the remainder of the newly acquired lands as territories, without restriction as to slavery, as it "did not exist [there] by law, and was not likely to be introduced,"—merely staving off the question till they formed State governments; (3, 4) annulling Texas' claim to New Mexico, but paying her a blank indemnity; (5, 6) non-abolition of slavery in the District of Columbia without the consent of Maryland, but prohibition of the slave trade in it; (7) a more effectual fugitive slave law; (8) non-interference with the interstate slave trade. Clay said that the question with the South was one of interests, with the North one of sentiment, and the latter was easier to sacrifice than the former. The northern members and their constituents did not agree to this, nor did the South as to the equivalents; and after two months' debate the question was referred to a compromise committee of 13, of which Clay was chairman. On 8 May it reported a bill of four parts, known in history as the Omnibus Bill (*par excellence*, for there have been others), to be passed or rejected as a whole. The essential changes were, that New Mexico and Utah were forbidden to pass laws respecting slavery, that California should not be admitted unless this were granted, that the blank for the Texas indemnity should be filled with \$10,000,000, and that no mention was made of the interstate slave trade. It will be observed that the gains in this revised "compromise" were pretty much all by the South. The bill of course embodied the specific legislation needed to make the resolutions effective. Part 1 consisted of the provisions for admitting California, New Mexico, and Utah, and indemnifying Texas; Parts 2 and 3 were the Fugitive Slave Law of history; Part 4 the provisions about the District of Columbia. This bill was stormily debated for nearly three months more, until 31 July, and amended until one item only was left, that admitting Utah, which passed the next day. Meantime Texas was arming and threatening war, and other States proposing to aid it; and Congress saw that the bills must be passed in some shape. The items were therefore voted on as separate bills, and all passed in Clay's form: Texas bill—Senate, 10 August, 30 to 20; House, 4 September, 108 to 97. California—Senate, 13 August, 34 to 18; House, 7 September, 150 to 56. New Mexico—Senate, 14 August, 27 to 10; House (together with the Texas bill), 4 September, 108 to 97. Fugitive Slave Bill—Senate, 23 August, 27 to 12; House, 12

September, 109 to 75; District of Columbia—Senate, 14 September, 33 to 19; House, 17 September, 124 to 47. The Fugitive Slave Law, the vital part of the compromise, was also its assured ruin, as it gradually turned the entire North into abolitionists; but the immediate cause of its collapse was the Kansas-Nebraska Bill (q.v.), which repealed not only the Missouri Compromise, but the present compromise which practically reaffirmed that. Consult: Von Holst, 'Constitutional History of the United States,' Vol. III.; Benton, 'Debates of Congress'; Stephens, 'War between the States,' Vol. II.; and lives of Clay.

Compromises of the Constitution. See CONSTITUTION, FORMATION OF THE.

Compsognathus, kōmp-sōg'nā-thūs, a genus of carnivorous dinosaurs (see DINOSAURIA) of the Jurassic Period, of very small size, hardly larger than a domestic cat, and slenderly proportioned. A very perfectly preserved skeleton has been found in the lithographic limestone of Solenhofen in Bavaria.

Comp'ton, Alfred George, American teacher: b. London, Eng., 1 Feb. 1835. He graduated at the College of the City of New York in 1853, and since then has taught chiefly mathematics. At present (1903) he holds the chair of physics in the College of the City of New York. He has written: 'A Manual of Logarithmic Computation' (1881); 'First Lessons in Wood-working'; 'First Lessons in Metal-working' (1890); with De Groot, 'The Speed-lathe' (1898); and 'Some Common Errors of Speech' (1898).

Compton, Henry, English bishop: b. Compton, Wynyates, 1632; d. Fulham 7 July 1713. He was the youngest son of Spencer, second earl of Northampton, studied at Oxford, and after the Restoration became a cornet in a regiment of horse. Afterward he left the army for the Church, became bishop of Oxford in 1674, and bishop of London in 1675. Charles II. made him a member of his privy council, and intrusted to him the education of his nieces Mary and Anne. He was distinguished for his hostility to the Roman Catholic Church. After the accession of James II., Dr. Sharp, rector of St.-Giles'-in-the-Fields, having become highly obnoxious to the court, Compton was required by a royal order to suspend him. His refusal to obey was made the ground of his own suspension. He was restored to his see at the time of the Revolution, and, together with the bishop of Bristol, made up the majority of two in the house of lords for filling the vacant throne. He performed the ceremony of the coronation of William and Mary, and was afterward appointed one of the commissioners for revising the liturgy. During the reign of Anne he was put on the commission for the union of England and Scotland. The reconciliation of dissenters with the Church of England was one of his favorite projects.

Compton, Herbert Eastwick, English novelist and miscellaneous writer: b. 16 Nov. 1853. He was educated at Marlborough College, and has traveled extensively. He has published: 'The Dead Man's Gift' (1890); 'A Master Mariner' (1891); 'Military Adventures of Hindustan' (1892); 'A King's Hussar' (1893); 'A Free Lance in a Far Land' (1894); 'The Inimitable Mrs. Massingham' (1900);

COMPTON — COMSTOCK

'The Ashanti War'; 'A Fury in White Velvet' (1901); 'A Scourge of the Sea' (1902); 'The Wilful Way' (1903); 'The Palace of Spies' (1903); 'Facts and Phantasies of a Folio-grub' (1903); 'Indian Life in Town and Country' (1904); 'The Twentieth Century Dog' (1904); 'The Queen Can Do No Wrong' (1904); etc. In 1904 he was a leader writer to the Tariff Reform League, and in 1905 was appointed organizing secretary to the Anti-Tea-Duty League, organizing the agitation against the excessive duty on tea.

Compton, William Cookworthy, English clergyman and educator: b. West Hackney, 1854. He was educated at Darmstadt, Tottenham, and Jesus College, Cambridge; became assistant master of Chatham House, Ramsgate, in 1877; was ordained deacon in 1878, and priest in 1879 by the Archbishop of Canterbury; was appointed curate of Holy Trinity, Ramsgate, in 1878; assistant master, Uppingham, in 1880; house master in 1881; and since 1892 has been headmaster of Dover College. He has written 'Rudiments of Attic Construction'; 'Cæsar's Seventh Campaign in Gaul'; 'The Athenians in Sicily'; etc.

Comptroller, an officer whose duty is to regulate the financial affairs of a community and supervise the keeping and auditing of its various financial accounts. In the United States treasury department there are three comptrollers, the first and second comptrollers of the treasury and the comptroller of the currency. The duties of the two first are to sign warrants or drafts, examine accounts, prosecute all debts and delinquents in behalf of the government, etc. The comptroller of the currency issues circulating notes to the national banks, superintends the national banks, exchanges old currency for new, etc.

Compurga'tion, a mode of defense allowed by the Anglo-Saxon law in England, and common to most of the Teutonic tribes. The accused was permitted to call a certain number (usually 12) of men, called compurgators, who joined their oaths to his in testimony to his innocence. They were persons taken from the neighborhood, or otherwise known to the accused, and acted rather in the character of jurymen than that of witnesses, for they swore to their belief, not to what they knew; that is, on the accused making oath of his innocence, they swore that they believed he was speaking the truth. Compurgation in the ecclesiastical courts was not abolished till the reign of Elizabeth. See Blackstone, 'Commentaries on the Laws of England'; Pollock and Maitland, 'History of English Law.'

Computing Scales. As is well known, the weight of a commodity is ascertained in order to form a basis for ascertaining its value at a given price per pound if in the United States or Great Britain and her colonies, or at a given price per kilogram if in nearly all other civilized countries.

The computing scale is an instrument by which the value is obtained, mechanically, at a given price per pound or kilo, thus avoiding the possible error of making the calculations mentally, and further, causing the operation of weighing and ascertaining the value to be more speedily accomplished.

The computing scale business, as a successful commercial enterprise for the world, was inaugurated in 1891. Several earlier attempts were made, but without success. The business has rapidly increased since the above date, and hundreds of thousands of these machines are now in use throughout the world. Until recent years the United States was by far the largest market, but they have been introduced into Europe, South Africa, Australia, and both the east and west coasts of South America, besides Canada, Mexico, and the West India Islands, until the export trade in computing scales now aggregates several hundred thousand dollars per year.

Construction of Computing Scales.—Broadly speaking, there are two types of computing scales; first, the variable leverage type, and second, the computed-chart type. The first type consists of a mechanism wherein the leverage of the computing beam may be varied so as to conform to the several units per pound or price per pound.

The computed-chart scale is further divided into two distinct kinds; first, the beam scale with computed chart, and second, the automatic scale with the computed chart. The former, or beam scale with computed chart, is a manually operated scale, operated as in ordinary scales by the movement of a sliding counterpoise, this sliding poise passing over the computed chart, and when the load is balanced by the movement of the poise, pointers on the poise indicate the total value of the commodity being weighed at the several prices per pound provided for on the computed chart.

The second, or automatic computing chart scales, are so constructed that when a commodity is placed upon the scale pan the load is automatically counterbalanced by the use of either counterbalancing springs or a pendulum counterbalancing weight, moving either the computed chart past a stationary indicator, or moving an indicator past or over the stationary computed chart, the indicator in either instance having placed thereon the several prices per pound, and each price per pound placed adjacent to a pointer or other means of indication showing the total value of the commodity being weighed at the several prices per pound provided for in the construction of the scale.

The automatic chart scale is further divided into two distinct types of scales with respect to the construction or arrangement of the chart: No. 1 type being constructed upon the principle of arbitrarily dividing the pound into as many parts as there are cents in the price per pound as a means of computing weight. For instance, at eleven cents per pound the pound is divided into eleven parts, each part representing one-eleventh of a pound. No. 2 type is constructed on the principle of dividing the pound into ounces and fractions of ounces on the binary system as a means of computing values. In other words the pound is divided into uniform fractions of the pound as in ordinary pound and ounce scales, and the true commercial value of each subdivision of the pound is indicated on the chart at the several prices per pound provided therefor.

Comstock, Anna (BOTSFORD). American natural history scientist, artist and engraver; b. Otto, N. Y., 1 Sept. 1854. After graduation

COMSTOCK — COMSTOCK LODGE

from Chamberlain Institute, Randolph, N. Y. in 1873, and from Cornell University in 1878, she studied art at the Cooper Union, New York city, and under John P. Davis. In 1899 she was appointed assistant professor of Nature Study in Cornell University extension work; and 1899-1900 was lecturer in Leland Stanford Junr. University extension work. She was awarded the bronze medal for wood engraving at the Pan-American Exposition of 1901. She is the author of 'Problems of the Six-Footed'; 'How to Keep Bees' (1904).

Comstock, Anthony, American reformer: b. New Canaan, Conn., 7 March 1844. In 1863 he enlisted in the 17th Connecticut regiment, served under Gen. Gilmore, and was mustered out in July 1865. In March 1873 he became secretary and special agent of the New York Society for the Suppression of Vice, and has completely identified himself with its work. It is said that largely through his special efforts 2,500 criminals have been brought to justice, and over 80 tons of indecent literature and pictures have been seized and destroyed. He has written: 'Frauds Exposed; How the People are Deceived . . . and Youth Corrupted' (1880), an exposure of various schemes operated through the mails; 'Traps for the Young' (1883); 'Gambling Outrages; or, Improving the Breed of Horses at the Expense of the Public Morals' (1887), and minor tracts for the furtherance of his work.

Comstock, kŭm'stŏk, Cyrus Ballou, American soldier: b. West Wrentham, Mass., 3 Feb. 1831. He graduated at West Point 1855, was chief engineer of the Army of the Potomac 1862-3, and attained the brevet rank of major-general of volunteers 26 March 1865, having been successively promoted for gallant, faithful, and meritorious services. He was later president of the Mississippi River Commission, and a member of the permanent board of engineers for fortifications. He was retired in 1895 as brigadier-general in the regular army. He wrote: 'Notes on European Surveys' (1876); 'Survey of the Northwestern Lakes' (1877); 'Primary Triangulation, United States Lake Survey' (1882).

Comstock, George Cary, American astronomer: b. Madison, Wis., 12 Feb. 1855. He graduated at the University of Michigan 1877 and from the law department of the University of Wisconsin 1883. He practised law for a time, but later devoted himself entirely to astronomy, and is now (1903) professor of that subject and director of the Washburn Observatory in the University of Wisconsin. He is a member of the National Academy of Sciences. He has written: 'Text-book of Astronomy' (1901); 'Text-book of Field Astronomy for Engineers' (1902).

Comstock, Harriet Theresa (SMITH), American author; b. Nichols, N. Y. 1860. She was educated in public schools and in the academy at Plainfield, N. J. She married Mr. Philip Comstock in 1885. Since 1895 she has become known as a prolific writer of juvenile stories, and is author of 'Molly, the Drummer Boy' (1900); 'Cedric the Saxon' (1901); 'A Boy of a Thousand Years Ago' (1902); 'A Little Dusky Hero' (1902); and 'Tower or Throne' (1902).

Comstock, John Henry, American entomologist: b. Janesville, Wis., 24 Feb. 1849. He graduated at Cornell University 1874; was United States entomologist at Washington, D. C., 1879-81, and since that date has been instructor and professor of entomology and general invertebrate zoology at Cornell. He has been a constant contributor to the literature of his subject, the following being the more important of his works in book form: 'Report on Cotton Insects' (1879); 'Introduction to Entomology' (1888); 'Manual for the Study of Insects'; 'Insect Life' (new ed. 1901); and 'Elements of Insect Anatomy' (3d ed. 1903) (with Kellogg).

Comstock, John Lee, American writer on physics: b. Lyme, Conn., 1789; d. Hartford, Conn., 21 Nov. 1858. He received a common-school education, studied medicine, and during the War of 1812 was assistant surgeon at Fort Trumbull, Conn., and on the northern frontier. He settled in Hartford, Conn., practised medicine until 1830, when he became an author by profession, and attained remarkable success in the compilation of text-books for educational purposes. His 'Introduction to Mineralogy' (1832) was used at West Point; of the 'Elements of Chemistry' over 250,000 copies were sold; while the 'System of Natural Philosophy' (1831) had a sale of over 900,000 copies (94th ed. N. Y. 1847), and was translated into the chief European languages. Others were: 'History of the Greek Revolution' (1828); 'History of the Precious Metals' (1849); 'Natural History of Quadrupeds' (1829); 'Grammar of Chemistry' (1825); 'Introduction to Botany' (3d ed. 1835).

Comstock, Theodore Bryant, American geologist: b. Cuyahoga Falls, Ohio, 27 July 1849. He graduated at Pennsylvania State College 1868, and at Cornell 1870, where he was professor of economic geology 1875-9. He accompanied Hartt's expedition to Brazil 1870, and Jones' Wyoming expedition 1873. He was professor of mining engineering and physics in the University of Illinois 1885-9, and assistant State geologist of Arkansas 1887-8, and of Texas 1889-91. He founded the Arizona School of Mines, was its director 1891-5, and president of the University of Arizona 1893-5. He has been manager, engineer, and consulting expert to many mining companies and syndicates, both American and foreign. He has published: 'Outline of General Geology' (1878); 'Classification of Rocks' (1877); 'Notes on the Geology of the San Juan Country' (1882); 'The Geology and Vein Structure of Southwestern Colorado' (1886); the last two in the 'Transactions' of the American Institute of Mining Engineers; and numerous papers in the 'American Journal of Science'; 'American Naturalist'; and 'Engineering and Mining Journal.'

Comstock Lode, a remarkable vein carrying silver sulphides with some native silver and considerable native gold, near Virginia City, Nev. The wide vein is a faulted fissure following the contact of a basaltic dike with the andesite country rock, the latter of Tertiary Age. The gangue is mainly quartz. The ores are of recent origin, and the waters ascending along the fissure are hot, making mining costly. Some wonderfully rich ore bodies, "bonanzas," were found in certain of the mines along the

COMTE

lode, and the history of its discovery, the great mining speculations based on it, and the final abandonment of nearly all the mines, reads like a romance. At present the deepest shaft on the lode is being reopened. The total yield of the lode from its discovery in 1859 up to July 1880 was over \$306,000,000.

Comte, François Charles Louis, frän-swä shärl loo-ē kônt, French writer on politics and jurisprudence: b. St. Enimie, department of Lozère, 1782; d. 1837. In 1814 he united with Dunoyer in starting a journal, called 'Le Censeur,' in which the adherents, both of Napoleon and the Bourbons, were roughly handled. On the second restoration of the Bourbons judicial proceedings were taken against the 'Censeur,' and the editors were fined and imprisoned. In 1819 Comte converted his journal into a daily newspaper, under the name of 'Le Censeur Européen,' and shortly after amalgamated it with the 'Courrier Français.' In 1821 a new prosecution condemned him to two months' imprisonment and a fine of 2,000 francs. He then went to Geneva, where he obtained a chair of public law, and taught with great success till the Helvetic Diet, in consequence of diplomatic complaints, found it necessary to refuse him an asylum. The work by which his name will be best known to posterity is his 'Traité de Législation Criminelle' (1827).

Comte, Isidore Auguste Marie François (ē-zä-dör ôg-üst mä-rē frän-swä), **Xavier**, French philosopher, founder of the "positive" system of philosophy: b. Montpellier 12 Jan. 1798; d. Paris 5 Sept. 1857. He was educated at the École Polytechnique, and embraced enthusiastically the socialist tenets of St. Simon, which became greatly in vogue in France after the Restoration. As one of his most distinguished pupils, he was employed, in 1820, to draw up a formula of the doctrines professed by the St. Simonian school, which he accordingly accomplished in his 'Système de Politique Positive.' This work did not, however, meet with the entire approbation of St. Simon, who asserted that Comte had made a very important omission by overlooking the religious or sentimental part of human nature. In 1826 he began lecturing on mathematics, and had for an audience such men as Humboldt, Blainville, Carnot, etc. In 1830 he began the publication of his 'Cours de Philosophie Positive,' completed in six volumes in 1842, and freely translated into English and condensed by Harriet Martineau (2 vols. 1853). The following is an abstract of the philosophical system propounded by Comte in that work. It consists of three leading positions. The first is, that the human mind in its progress, historically and individually, passes through three stages of development: (1) The theological, in which all the phenomena of nature are imputed to the active agency of the gods. (2) The metaphysical, in which the gods are supplanted by certain abstractions called "nature," "harmony," "number," etc. (3) The positive or scientific, in which it is discerned that man can know nothing of causes, and is only able to refer phenomena to their general laws of existence or succession. Arrived at this stage, science is born, and knowledge, no longer baffled by the inscrutable or misled by the imaginary, advances from one generalization to

another, to a comprehensive perception of the universe as a whole. The second position is, that in this advance the mind proceeds in a regular hierarchical order, from the simple to the complex, or from the most elementary relations of numbers to the highest and deepest complications of society and life. The hierarchical order of the sciences is arranged by Comte as follows: 1. The most general and simple of all, dealing only with numbers and magnitudes—mathematics. 2. The application of the principles of mathematics to the phenomena of the celestial sphere, or astronomy. 3. The application of mathematics and astronomy to the phenomena of the terrestrial sphere or general physics, including heat, light, optics, electricity, etc. 4. The science of the phenomena of individually organized being, or vegetable and animal life, termed biology. 5. The science of the phenomena of corporate or social life, which he terms *sociology*, and which, as presupposing and containing all the former, he represents as the essence and perfection of all the sciences. The third position lays down the laws and principles which regulate social life, constituting order and liberty. The first element of order is the family; the second the community, composed, not of individuals, but of families, and co-operating, to a certain extent, in their employment; and the third, the government or state. Liberty is the effect of this harmonious organization, and progress the development of it, by the conquest (1) of material nature; (2) of the lower propensities by the higher intellectual faculties; and lastly, of the selfish passions by the noblest social affections. In 1832 he became one of the professors at the École Polytechnique. In 1843 he published a mathematical work, 'Traité Élémentaire de Géométrie Analytique,' and in 1848 'Discours sur l'Ensemble du Positivisme,' in which the doctrines laid down in his previous work are recapitulated. But some change had, in the interval, taken place in Comte's views. The death of a lady, whom he calls Clotilde, and for whom he had conceived the most ardent affection, impressed his mind deeply with the conviction that something more than a mere material array of facts was needed to satisfy the cravings of the human soul. The religious tendencies of the heart had been hitherto wholly overlooked by him, and he now perceived the necessity of presenting some object to supply this want. He invented a religion which consists in referring the whole harmony of existence to, and concentrating its essence in one great Being, whom he termed Humanity. As manifestations and representatives of this Being, he maintained that the proper objects of worship are those who have shown themselves the greatest benefactors to the human race—in fact, a hero-worship. This system is propounded by him in a book published in 1849, entitled 'Culte Systematique de l'Humanite Calendrier Positiviste, ou Systeme Général de Commemoration Publique,' in which he has drawn up a regular calendar of demigods, presiding over the months, weeks, and days of the year, and having each their appropriate festivals. The 13 months into which he divided the year, he called Moses, Homer, Aristotle, Archimedes, Cæsar, St. Paul, Charlemagne, Dante, Gutenberg, Shakespeare, Descartes, Frederick, and Bichat. He assumed the office of high priest of this new religion, performing marriage and

COMTE — CONANT

funeral rites on behalf of the disciples induced to adopt his system. These, however, were never very numerous, and by the time of his death had nearly all dropped off one after another. The last work published by him was entitled 'Système de Politique Positive, ou Traité de Sociologie, instituant la Religion de l'Humanité,' (1851-2). However extravagant many of Comte's theories may appear to be, they nevertheless display in their enunciation a powerful intellect with much universality and comprehensiveness of knowledge. Many new and original ideas are brought forward, and much matter afforded for thought and reflection. His works have been made known to English readers mainly by Mr. G. H. Lewes, 'Comte's Philosophy of the Sciences,' and Miss Martineau's translation above mentioned. See POSITIVISM.

Bibliography.—Robinet, 'Notice sur L'œuvre et sur la vie de Comte' (1860); Mill, 'Comte and Positivism' (1865); Fiske, 'Outlines of Cosmic Philosophy' (1st vol. 1874); Littré, 'Auguste Comte et la Philosophie Positive' (1877); Caird, 'The Social Philosophy and Religion of Comte' (1885); Gruber, 'Auguste Comte, sein Leben und Seine Lehre' (1889).

Comte, Pierre Charles, pē-ār shārl, French painter: b. Lyons 23 April 1823; d. 1895. He studied at Paris as a pupil of Robert Fleury, and exhibited his picture 'Lady Jane Grey,' in 1847, which won him considerable attention. His other works include: 'Henry III. Meeting the Duke of Guise'; 'Joan of Arc at the Coronation of Charles VII.'; 'A Scene at Fontainebleau' (at Washington, D. C.); 'Gipsies Before Louis XI.'; and 'The Last Visit of Charles V. to the Castle of Ghent.'

Comte de Paris, dē pā-rē. See PARIS, COMTE DE LOUIS PHILIPPE ALBERT D'ORLEANS.

Comus, kō'mūs (Greek *kōmos*), in ancient Greece the name given to a kind of festal procession in honor of some of the gods (as Bacchus) and sometimes in honor of victors in the public games. The term had also the wider sense of revel and merry-making. This name was also given to a divinity supposed to preside over such festive occasions, but as his name does not occur in early ancient writers whose works have been preserved, he is evidently a creation of later times. He is first mentioned by Philostratus (about 200 A.D.).

Comus, a masque by John Milton, given before the Earl of Bridgewater at Ludlow Castle, Shropshire, England, 29 Sept. 1634. It was first printed in 1637. An altered version of it was played at Covent Garden Theatre, London, in 1773, and in 1901 it was played at Tufts College, Massachusetts, by the students of that institution.

Comyn, kŭm'in, John, the elder, Scottish noble: d. about 1300. He was one of the commissioners sent to confer about the marriage of the Maid of Norway to Prince Edward of England. On the competition for the Scottish throne in 1291 Comyn put in a claim as a descendant of Donald Bane.

Comyn, John, Scottish noble: d. Dumfries 1306. He was called the "Red Comyn," was chosen one of the three guardians of Scotland, and defeated the English at Roslin in 1302. He submitted to Edward I. in 1304, and was killed

by Bruce in the Convent of the Minorites at Dumfries in 1306, a well-known episode in the life of the great Scottish king.

Con, kōn, an Italian preposition signifying with, and of frequent occurrence in musical phraseology; *con amore*, with feeling: *con brio*, brilliantly; *con gusto*, with taste, etc.

Conan'icut, an island of Rhode Island, situated in the lower part of Narragansett Bay. It is about nine miles long. The town of Jamestown is near the east shore, and there is a lighthouse at the north end.

Co'nant, Alban Jasper, American artist: b. Chelsea, Vt., 24 Sept. 1821. He settled in St. Louis in 1857, and during the Civil War visited Washington, and painted portraits of President Lincoln, Secretary Stanton, and Attorney-General Bates. He was a curator in the University of Missouri for eight years, and made valuable studies of the archaeology and antiquities of the Mississippi Valley. In 1880 he was appointed Délégué Correspondant de l'Institution Ethnographique of Paris. He has published: 'Footprints of Vanished Races in the Mississippi Valley' (1879, 4to 1); 'The Archaeology of the Missouri Valley'; 'My Acquaintance with Abraham Lincoln,' etc.

Conant, Charles Arthur, American economic writer: b. Winchester, Mass., 2 July 1861. He was for some years after 1880 a journalist in Boston, from 1889-1901 was Washington correspondent of the 'New York Journal of Commerce' and in 1903 became treasurer of the Morton Trust Company. He has published: 'A History of Modern Banks of Issue'; 'The United States in the Orient: the Nature of the Economic Problem' (1900); 'Alexander Hamilton'; 'Securities as Payment'; 'Wall Street and the Country' (1904).

Conant, Hannah O'Brien Chaplin, American author: b. Danvers, Mass., 1809; d. Brooklyn, N. Y., 18 Feb. 1865. In 1830 she married Thomas Jefferson Conant (q.v.). She was a woman of versatile talent, having an excellent knowledge of Oriental tongues, which enabled her to share in the biblical studies of her husband. She frequently contributed to the literary and religious periodicals of the day, and in 1838 became editor of the 'Mothers' Monthly Journal' at Utica, N. Y. She published: 'Lea: or the Baptism in the Jordan, by G. F. A. Strauss' (1844); 'First Epistle of John Practically Explained, by A. Neander' (1852); 'The New England Theocracy, by H. F. Ulden' (1859), all translations from the German; 'The Earnest Man: Sketch of the Character and Labors of Dr. A. Judson' (1855); 'The English Bible: Popular History of the Translation of the Holy Scriptures into the English Tongue' (1856; English ed. 1859; new ed. 1881).

Conant, Thomas, Canadian descriptive writer: b. Oshawa, Ont., 15 April 1842; d. there 14 March 1905. He was educated in the public schools and at Eddystone Seminary in Geneva, N. Y., and achieved distinction with brilliant sketches of scenery and articles on Canadian and other subjects. In 1896 he visited Australia, India, and the Orient.

Conant, Thomas Jefferson, American biblical scholar: b. Brandon, Vt., 13 Dec. 1802; d. Brooklyn, N. Y., 30 April 1891. He was graduated from Middlebury College in 1823,

CONATION — CONCEPCION

and between 1825 and 1857 taught the classics and biblical literature in Columbia College, Waterville (now Colby) College, Maine, Madison, now Colgate, University, Hamilton, N. Y., and Rochester Theological Seminary. Taking up the studies that soon gave him a wide reputation, he was appointed by the American Bible Union one of a committee to prepare a revision of the English version of the New Testament. He was also a member of the American committee on the English revision of the Old Testament, and his versions were highly esteemed and constantly used by the English revisers. His numerous publications include translations of the 11th and 17th editions of Gesenius' 'Hebrew Grammar'; 'Job; Revised Version, and Notes' (1856); 'Matthew, Revised Version' (1860); 'Baptizein, Its Meaning and Use' (1860); 'Genesis, Revised Version' (1868; 1873); 'The New Testament; Common Version Revised' (1871); 'Psalms, Revised' (1871); 'Proverbs, Revised' (1872); 'Greek Text of the Apocalypse, as edited by Erasmus' (1873); 'Prophecies of Isaiah, Chapters 1-12' (1874); and 'Historical Books of the Old Testament, Joshua to 2 Kings' (1884).

Cona'tion (from Lat. *conari*, to attempt), a term in its original sense used simply to express the idea or to designate the act of attempting or undertaking something. In present usage it is appropriated by psychologists to the expression of desire and volition as manifested in or constituting voluntary agency, although as a factor in consciousness and effort its precise implications appear not to have been finally determined. In the exertion of the muscles, and in direct conscious attention, the agency of conation in an individual finds its two representative aspects. Attention, desire, and endeavor, with their accompanying states of thought and feeling, are held by some psychologists to be the completing aspects of conation; while others maintain that its function is limited to the sensations of straining, with consequent states of consciousness, pleasureable or otherwise, attendant upon contraction of the muscles. Whether conation is to be regarded as simple or complex in its psychological aspects, remains therefore a question for further research and experiment. Consult: James, 'Principles of Psychology'; 'Experimental Psychology'; Scripture, 'The New Psychology'; Titchener, 'Outline of Psychology'; Hyslop, 'Syllabus of Psychology'; Stout, 'Analytic Psychology.'

Conaty, Thomas James, American Roman Catholic prelate: b. Ireland 1 Aug. 1847. In 1850 he came with his parents to America, the family settling in Taunton, Mass., and in the district schools of that city he received his primary education. He entered the College of Saint Sulpice, Montreal, in 1863, completed his humanities in 1867, and spent the following two years at Holy Cross College, Worcester, Mass., being graduated in 1869. His ecclesiastical course was pursued at the Seminary of Saint Sulpice, Montreal, where he was ordained priest 21 Dec. 1872. First named assistant at Saint John's Church, Worcester, Mass., and afterward chosen pastor of the Church of the Sacred Heart in that city, Father Conaty was actively interested in the advancement of Catholic education. He was likewise an ardent promoter of the temperance cause, being first pres-

ident of the Springfield Diocesan Temperance Union, and, in 1887, national president of the Catholic Abstinence Union of America. Father Conaty was also prominent in establishing the Catholic Summer School in 1892—the same now flourishing at Plattsburg, N. Y.—being its president from 1893 to 1897. In 1889 Georgetown University conferred upon him the title of D.D., and in 1896 Laval University, Quebec, bestowed the same honor. He was chosen rector of the Catholic University in 1896, made a domestic prelate in 1897, consecrated titular bishop of Samos 24 Nov. 1901, and appointed bishop of Monterey and Los Angeles 27 March 1903. He is a frequent contributor to various periodicals, and is the author of 'New Testament Studies' now used in many Catholic schools. At present (1905) Bishop Conaty's diocese has a Catholic population of about 70,000; 136 priests; 149 churches; 24 parochial schools; 4 Indian schools; 6 orphan asylums; 2 hospitals, etc.

Concentra'tion, in chemistry, the act of increasing the strength of solutions. This is effected in different ways: by evaporating off the solvent, as is done in the separation of salt from sea-water; by distilling off the more volatile liquid, as in the rectification of spirit of wine; by the use of low temperatures, as in the purification of benzol; by difference of fusibility, as in Pattinson's process for desilverizing lead.

Concentration Camp, a camp into which non-combatants are gathered in time of war. During the Cuban rebellion of 1895-8 many peaceable and defenseless people were forced to abandon their homes in the agricultural regions and were imprisoned upon the barren waste outside the residence portions of the cities, and within the lines of entrenchment. It is estimated that at least 400,000 persons, mostly old men, women, and children, were thus subjected to concentration under Weyler's administration. They were known as reconcentrados. The British also carried on a scheme of concentration of non-combatants during the Boer war, but those who were kept in the concentration camps were not subject to physical hardships such as disgraced the camps in Cuba. In the "appeal" issued by the Boer generals 25 Sept. 1902, thanks were tendered to those sympathizers who had rendered pecuniary and other assistance to Boer wives and children in the concentration camps. The British government expended about \$1,000,000 per month on the burgher camps and stated that they were still maintained after the close of the war, "only in the cause of humanity." Provision was made at great expense in these camps for the education of the Boer children. The term concentration district may be applied to the rendezvous where troops are gathered during the process of mobilizing an army.

Concen'tric. Similar figures having a common centre are called concentric.

Concepción, Chile, a province lying between the provinces of Ñuble and Bio-bio. Area 3,532 square miles. It is divided into the departments of Coelemu, Puchacay, Rere, Concepción, Talcahuano, and Lautaro. The importance of its capital, its commercial activity, and its numerous ports make this the most interesting province in the south of Chile. Two of the

CONCEPCION — CONCEPT

largest bays in the republic are on its coast, those of Talcahuano, which is defended by fortifications, and Arauco, which includes the ports of Lota and Coronel, notable for their coal mines. The city of Concepción is the capital. Talcahuano (15,500 inhabitants) is a military port, with a dry-dock for repairing warships and mercantile vessels, and at the same time an active commercial port. Products of the whole southern region are brought to it for exportation, and it supplies cities of the interior with a large part of their merchandise. The port of Tomé (5,000 inhabitants), situated near rich agricultural districts, exports a large quantity of wine and has a woolen mill, etc. Penco, a small port 10 miles by rail from the city of Concepción, is a favorite seaside resort and has a sugar refinery and coal mines in the neighborhood. The population of the province is 225,000.

Concepcion, Chile, the capital of the province of the same name. It is situated on the banks of the Bio-bio River, and is connected by a short railway with its ports of entry, Tomé and Talcahuano, 8 miles distant on the Bay of Concepción. In the latter city a United States consular agent resides. The streets and squares of the city are wide, well-paved, well-lighted, and clean. An electric railway traverses the principal streets. Concepción is the seat of a bishop. The chief buildings are the city hall, the cathedral, theatre, the agricultural school, and the normal school. The city is in a fertile agricultural region and has an active trade in agricultural products, hides, tallow, wine, flour, beef, etc.; very little manufacturing is carried on, the largest establishment being breweries, furniture, and carriage factories, saw-mills, flour-mills, distilleries, etc. It is in importance the third city of Chile. Concepción was founded in October 1550 by Pedro de Valdivia, and was originally situated on the site of the present city of Penco. In 1555 the place was pillaged and destroyed by Araucanian Indians; and in 1557 was refounded by Garcia Hurtado de Mendoza. In 1730 the town was totally ruined by an earthquake, and in 1751 suffered from a like catastrophe in consequence of which the site was removed and the city rebuilt in its present location in the fertile plain on the north side of the Bio-bio, 270 miles southwest of Santiago. At the time of the Spanish occupation Concepción was the second largest city in the country. In 1818 the declaration of Chilean independence took place here. In 1835 another disastrous earthquake visited the city and for a long time the place was almost entirely desolate, but it was afterwards resettled and from that time the buildings have been more substantially and pretentiously erected, the streets reconstructed and the area of the city greatly extended. Pop. 55,000.

Concepcion, Paraguay, also called Villa Concepción, the second city of the republic in commercial importance, though not in the number of its inhabitants. It is situated on the left bank of the Paraguay River, 213 kilometers from Asunción. It is a port of entry and delivery, where the steamers navigating the Upper Paraguay regularly touch. The principal buildings are the city hall, custom-house, parish church, market, and some fine private residences.

It has a line of street-cars, telephone service, two banks, and several commercial houses that trade directly with Argentine and European cities. Yerba-maté and cattle are the principal items of the city's commerce. Pop. 13,654.

Concepcion, Philippines, a former district of the island of Panay, now part of the province of Iloilo, situated on the northeast part of the island; area 683 square miles. The former capital, Concepcion is a pueblo situated on the east coast of the island, 47 miles northeast of Iloilo; pop. 5,736. Pop. of the district (1900) 19,342.

Concepcion, Philippines, a town (pueblo) in Tarlac province in the island of Luzon, 12 miles south of the town of Tarlac. Pop. 13,499.

Concepcion, a lake in the central portion of the department of Santa Cruz, Bolivia.

Concepcion del Uruguay, Argentina, a city in the province of Entre Rios, on the Uruguay River about 160 miles north of Buenos Ayres. It is connected by railway with Paraná, and the river is navigable for large vessels, thus rendering the city an important shipping point. It is in an extensive and fertile agricultural region and the trade consists chiefly of these products and cattle and packed meat. There are also some salting establishments in the city. A national college and a normal school are located in the city. Concepción del Uruguay was founded in 1778 and was originally called Concepción-del-de-la-china; was formerly the capital of the province and is now the episcopal city. Pop. about 6,000.

Concept. A concept is an idea which has been formed by thinking, and which is permanently embodied in language by a word or other definite symbolic expression. There are two main differences between a concept and a precept. In the first place, the latter seems to be directly presented through the senses and does not imply any conscious reflection. And again, a precept as presented has always a particular individual form, while a concept is an ideal construction, and, as such, has universal significance. For example, I may perceive through my senses the particular object which I call my watch; but to form a concept of "watch" is to think in general terms the relation of the mechanism of the parts to the purpose of the whole. The concept must also be distinguished from the mental image which appears in memory or imagination when the object is not directly present in sensation. The latter is always a particular psychological process, and therefore cannot adequately represent the general relations of the concept. We must not confuse the presence of images in the mind with thinking. It is true that a concept cannot be represented in terms of psychological content except by a particular image, and it probably always is represented by some such image. But the concept is a universal mode of thinking, and the psychological imagery which accompanies it is largely individual and indifferent. The universal relations of the concept of triangle, for example, are not limited by the form of the particular figure which I represent to myself mentally, or draw upon paper, though the latter may aid me in comprehending those relations. The concept is ideal in character; it is a universal

CONCEPTION — CONCERTINA

significance, and must never be confused with a particular psychological image.

Socrates was the first to bring this universal element of knowledge into clear light. When the Sophists pointed to the differences and variations of perceptions and feelings in individuals, and drew the conclusion that objective knowledge was impossible, Socrates showed that concepts which are true for all men can be discovered and defined, and that this is the true quest of thought. Amid the flux of individual opinion, science is still possible, since it is constituted by this system of universal concepts. Plato and Aristotle developed further the Socratic doctrine of concepts and gave it an ontological application. By means of the concept, the true form or permanent essence of things is said to be apprehended, as opposed to the accidental and changing appearances. The question as to the nature of the concept played an important part during the Middle Ages (See NOMINALISM, REALISM, CONCEPTUALISM). The view that is perhaps most commonly held to-day, regards the concept as derived by abstraction (q.v.) from perceptual experience, by selecting out what is common in a number of instances and combining these common elements into a general idea. It must not be forgotten, however, that concepts are not formed by the piecing together of psychologically common elements in a mechanical way, but are the products of thinking; and that thinking is itself judgment or interpretation of significance in universal terms. It is true, as Kant said, that concepts without percepts are empty; our thinking does not go on in a vacuum apart from concrete experience. But the concept is not universal because it has been compounded out of elements that are common to a number of objects, but because it is the mind's expression in terms of ideal significance. Concepts, however, can scarcely be said to exist without language. The relation between thought and the words which express it is of the closest and most intimate kind. The word sums up in itself the results of the conceptualizing process, thus giving to it a reality and permanence which make progress possible. It is through learning the words of a language that we are able to share in the concepts of other men and other generations. Language is thus a permanent record of thought's achievements, and its development is not something external to the evolution of thinking, but in one aspect may be said to be a different side of the same process. The concept then cannot be defined apart from its expression in language; for this expression is no mere external and accidental feature of the idea, but is organically and necessarily connected with it.

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Conception, Immaculate, of the Blessed Virgin Mary, a dogma of the Roman Catholic Church, defined as such by Pope Pius IX. The purport of this definition is very commonly misapprehended, being understood to relate to the virginal motherhood of Mary; but the doctrine of the Roman Catholic Church, as expressed in the definition proclaimed by Pius IX. in his Letter Apostolic of 8 Dec. 1854 is that Mary "at the first instant of her conception was, by a singular privilege and grace of Almighty God, in virtue

of the merits of Jesus Christ the Saviour of mankind, preserved immaculate from all stain of original sin." This doctrine, though thus formally declared an article of Catholic belief only in the middle of the 19th century, had for many centuries been believed either explicitly or implicitly by saints and fathers of the Church. When at last the sense of all the bishops and all the churches of the Catholic communion with regard to this belief was elicited by a letter of Pius IX. addressed to them, the reply from the great majority of them was strongly in favor of a definition: yet a good many held it unwise to make the definition for the reason that neither in Scripture nor in Christian tradition could, as they thought, sufficiently clear intimations of it be found, or they doubted the wisdom of promulgating a definition at that time. See IMMACULATE CONCEPTION.

Conception of Our Lady, Sisters of the, an order of nuns, founded in Portugal in 1484 by Beatrix de Sylva, in honor of the Immaculate Conception. It was confirmed in 1489 by Pope Innocent VIII., and the Cistercian rule was adopted. In 1489 Cardinal Ximenes put the nuns under the direction of the Franciscans, and imposed on them the rule of Saint Clara. The order subsequently spread into Italy and France.

Conception. See EMBRYOLOGY.

Conceptualism, kōn-sēp'tū-al-izm, in metaphysics, a doctrine in a sense intermediate between realism and nominalism. Conceptualism assigns to universals an existence which may be called logical or psychological, that is, independent of single objects, but dependent upon the mind of the thinking subject, in which they exist as notions or conceptions. See NOMINALISM; REALISM.

Conceptualist, one of a metaphysical sect — if indeed it has coherence enough to be called a sect — which arose in the Middle Ages during the disputes between the Nominalists and the Realists; or one who holds the views of conceptualism. The conceptualist school sought to occupy an intermediate position, but it approximated much more nearly to the Nominalists than to the Realists.

Concert Pitch, the pitch of a certain note in the musical scale adhered to by the general body of musicians. The middle C (seated on the ledger-line which unites the G and F clefs) is produced by a string making, according to theorists, 512 vibrations per second. In England, however, the pitch has risen to 538, while in Germany it is 528, and in France 522. The gradual rise of the pitch from the theoretical 512 vibrations is attributed to the necessities of piano-tuning on the one hand, and the desire to attain a more intense and brilliant tone on the other. See PITCH; also MUSICAL ELEMENTS AND TERMS.

Concertina, kōn-sēr-tēna, a musical instrument invented by Sir Charles Wheatstone. It is generally polygonal in shape, is held between the hands so that the fingers drop naturally down on studs which raise the valves and allowed the air (supplied by the bellows between the finger-boards) to act upon a series of metal tongues of the same construction as those of the accordion or harmonium. The usual range

CONCERTO — CONCHOLOGY

of the instrument is from the lowest G on the violin to the C three and a half octaves higher, including the chromatic tones. The German concertina is a much less perfect instrument, as only tunes on a limited number of keys can be performed on it.

Concerto, kōn-chār'- or kōn-sēr'to, a kind of composition first introduced by the Italian musicians of the 17th century, for the purpose of showing the capabilities of the violin, or of a particular performer on that instrument. The principal composers and artists in this department are Corelli, Viotti, Rodes, Baillot, Kreutzer, Alard, Beriot, and Vieuxtemps. Subsequently concerti were written for other instruments, such as the flute, the piano, etc. Among the most successful composers for the piano are Bach, Mozart, Hummel, Chopin, Schumann, Ries, Czerny, and Thalberg. Concerti usually consist of three movements, an *allegro*, an *andante*, or *adagio*, and a lively *rondo*. Except in the *tutti* the orchestra should be as subservient to the instrument for which the piece is written as it should to a vocalist.

Concerto grosso is an expression applied to the great or grand chorus of the concert, or to those places of the concert in which the *ripienos* and every auxiliary instrument are brought into action, for the sake of contrast and to increase the effect.

Concerto spirituale was a concert at Paris, performed in the religious seasons, when the theatres were closed. The pieces performed, however, were not always of a spiritual kind. It was introduced in 1725 by Anne Danican, called Philidor.

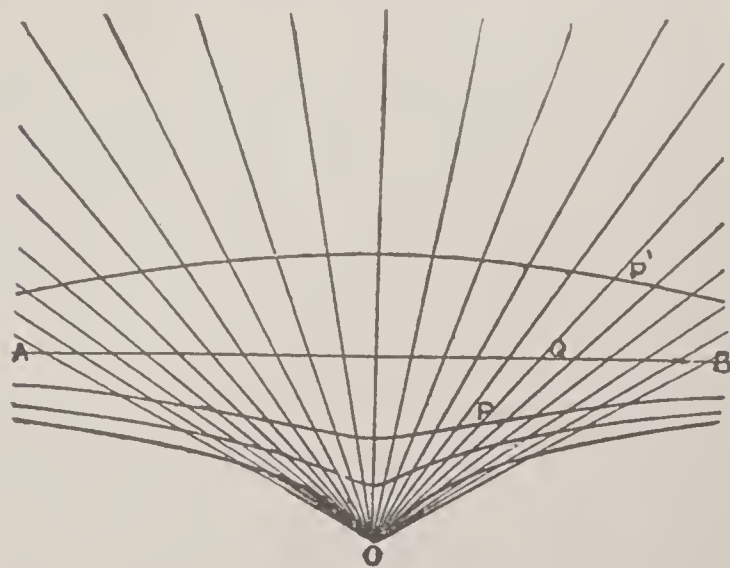
Conch, kōnk, a name of certain large marine gastropods, especially of the king conch (*Strombus gigas*), abundant in the southern United States and parts of the West Indies. In Florida the shells are made into horns used for calling the farm hands, as is still done in the East Indies with shells of the genus *Triton*. This is one of the shells used for making cameos, and great quantities are collected in the Bahamas and shipped to Liverpool for this purpose to some extent, but more for conversion into buttons and similar small articles, in allusion to which industry the native whites of the Bahamas are called "Conchs." The name is also applied to two large sea-snails, the *Fulgur carica* and *Sycotypus canaliculata*, common on most parts of the Atlantic coast.

Concha, José Gutierrez de la, hō-sā' dā la kōn'chā (MARQUES DE LA HABANA), Spanish general: b. Cordoba, Argentine, 4 June 1809; d. Madrid, Spain, 5 Nov. 1895. He went to Spain in childhood, entered the army, took part in the struggles in South America, and against Don Carlos, was appointed lieutenant-general in 1839, and officiated as captain-general of the Basque provinces 1843-6. He was captain-general of Cuba 1849-52, when he was replaced by Cañedo. Joining his brother in opposing the government, he was banished from Spain in 1854, and fled to France, where he was detained at Bordeaux. After the July revolution of 1854, he was re-appointed captain-general of Cuba, and, with the exception of a short suspension of his functions by Narvaez's administration in 1856, when Lersundi was appointed as his successor, he continued to hold office until December 1858, when he tendered his resignation.

Returning to Spain he was at various times minister to France, president of the senate, and minister of war, and captain-general of Cuba again 1874-5.

Concha, Manuel (mä'noo-ël) de la (MARQUES DE DUERO), Spanish general and statesman: b. Cordoba, Argentina, 25 April 1808; d. Muro 28 June 1874. He was a brother of José de la Concha (q.v.), fought in early life against Napoleon and the revolted Spanish colonists in South America, and afterward against Don Carlos. In 1847, during the complications with Portugal, he was put in command of 6,000 men, and took possession of Oporto. Having issued at the end of 1853, in concert with O'Donnell and Bravo-Murillo, the famous protest against the policy pursued by the government, he was banished from Spain after the revolution of July 1854, and repaired to Paris; but was soon recalled to Madrid by the outbreak which terminated in the exile of Maria Christina, the downfall of Narvaez, and the restoration of Espartero. Concha was now made inspector-general of cavalry and marshal; but on 12 Oct. 1856, when Narvaez came again into power, he was compelled to relinquish these posts. He was killed in the battle of Muro while serving in the republican army against the Carlists.

Conchoid, kōng'koid, a curve, shell-like in flexure (whence the name), invented by Nicomedes in the 2d century B.C., and used by him for finding two mean proportionals. If a straight line always passes through a fixed point *o*, and a point *Q*, fixed into the revolving line, always moves along the line *AB*, then any point *P* in the revolving line always at the same distance from *v* will trace out a conchoid. And, since the length *QP* can in any position of the revolving line be measured either toward or from *o*, it is evident that, corresponding to any given length assigned to *QP*, two conchoids can be described, one above and the other below the line *AB*. These are known as superior and inferior conchoids. Moreover, with a given point *o*, and a given straight line *AB*, any number of pairs of different conchoids can be described by varying the length *QP*. Moreover, the shapes



Conchoid.

of all such curves will vary according to the length of *QP*. Thus, if *QP* is less than the perpendicular from *o* on *AB*, the shape is as given in the adjoining figure, and this isolated point *o* is also a point on the curve.

Conchology, kōng kōl'ō jē, the science of shells. Two well-marked stages in its develop-

CONCHOS — CONCONE

ment are traceable. At first shells were studied without any reference to the animals of which they constituted the hard framework or skeleton. Subsequently the study took a wider scope, and for the first time became worthy of being called a science, when the animals and their shells were viewed as parts of one common whole. When shells were looked upon as little more than ornamental objects, those who studied conchology were not generally of a high order of intellect; but since the rise of geology and the discovery that, of all fossils, shells are able to furnish the most definite information regarding the several strata, and consequently regarding the history of by-gone times, scientific minds of the very first class have given keen attention to shells. Some of these belonging to land animals, others to those inhabiting fresh water, and the great majority to those which are marine.

When shells, and they alone, were studied, conchology was a not unsuitable name, except that the termination -ology suggested that the investigation was more scientific than in most cases it really was. When the animals came to be carefully examined, M. de Blainville proposed for this deeper study the name malacozoology — that is, the study of the softer animals, mollusks; this has been since abbreviated into malacology. At the present time malacology is a highly developed branch of zoological science which treats of everything relating to the great phylum *Mollusca* (q.v.). Conchology is frequently used in the same sense, but cannot altogether escape the opprobrium which attaches to it as a mere collector's pastime. Consult Tryon and Pilsbry, 'Manual of Conchology.'

Conchos, kōn'chōs, or **Conchas**, Mexico, a river in the state of Chihuahua; rises high up in the Sierra Madre, flows southeast, northeast, and then north through a beautiful country, comprising rich table-land, and empties into the Rio Grande near Presidio del Norte, after a course of about 350 miles. It is the largest tributary of the Rio Grande, and very little inferior in size to that river itself. Its principal branches are the Florido, Buenavista, San Pedro, Chihuahua, and Balleza, which, with their lesser tributaries, water more than one third of the state.

Conchyolin, kōn-kī'ō-līn, an organic base allied to chitin (q.v.), which enters into the composition of the shells of mollusks. The conchyolin forms a thick cuticular layer of organic matter containing carbonate and a slight proportion of phosphate of lime. In dead shells the conchyolin soon disappears, leaving the shell much more brittle than when it was alive.

Conciergerie, La, lä kōn-sē-ēr-zhē-rē, a noted prison in Paris, which was a part of the Palais de Justice. Many royal prisoners were there confined, and during the Reign of Terror it was the scene of fearful butcheries, 328 prisoners being put to death in one week. Marie Antoinette went from her cell in this prison to her execution.

Concil'ium in Trullo, or **Concilium Quinisextum** (Council in Trullus, Fifth-Sixth Council), a council or synod of the Church convened in a hall (called the Trullus) of the imperial palace at Constantinople in the year 692. It was an assembly of eastern and western bishops called for the purpose of enacting canons of

Church discipline: this the council did, both adding to the existing canons 102 new ones and confirming ancient canons that had fallen into desuetude. Its work was to supplement the decrees of the 5th and 6th councils of the Church: hence it is known as the Quinisext Council.

Conclave, both the apartment in which is conducted the election of a Pope and the college of cardinals assembled there. The procedure in electing popes is substantially the same to-day as it was in 1274 when it was prescribed by the Council of Lyons. When a Pope dies, a secretary of the college of cardinals summons all the cardinals to an election to be held on the 10th day after the demise. In whatever city the Pope dies, there the conclave must be held. The conclave apartment must be immediately prepared in such a place and manner as will insure safety of person and non-interference from outsiders. If the conclave is held in Rome, the great halls of one of the papal palaces is divided by wooden partitions into small rooms or cells, two or at most three cells for each cardinal and his personal attendants. The apartments all open on one corridor, and to that there is but one means of access from without, and that is strictly guarded. After the 10 days have elapsed, the cardinals all assemble in the Vatican church and assist at the Mass of the Holy Ghost, after which they form a procession and proceed to the conclave, each one taking the apartments assigned to him. The first day the conclave is open to the public, and numerous persons, high and low, avail themselves of the permission to enter. In the evening all outsiders leave, and the cardinals must remain until a Pope is chosen. A two thirds majority vote is requisite. Daily provision of food is brought in from outside, which is closely scrutinized lest any written communication should reach the cardinals: if no election is had after five days the food supply is restricted to bread, wine, and water, or rather used to be, for the rigor of the law is now much relaxed. A cardinal coming from a distance is admitted after closure. The election is made by scrutiny, that is, by ballot, or by compromise, that is, by a committee chosen by a majority of the conclave, or by acclamation. Sometimes a conclave has sat many weeks, or even months, before reaching an election: the conclave which elected Pius VII. (1799) sat during six months. The conclave in which Leo XIII. was elected Pope consisted of 62 cardinals, and it began its session the evening of 18 Feb. 1878. The scrutiny of the morning of the 20th showed that Cardinal Pecci was chosen. The election was then ended and he was made Pope by acclamation. The conclave at which Pius X. (q.v.) was elected began its session 31 July 1903, and the first ballot was cast the morning of 1 Aug. The scrutiny of the morning of 4 Aug., the seventh ballot, showed that Cardinal Sarto, patriarch of Venice, was elected. He chose the name of Pius X. This conclave was remarkable as being the only one of which a cardinal from the United States was a member.

Concone, Giuseppe, joo-sēp'pě kōn-kō'nā, Italian teacher of vocal music: b. Turin 1810; d. there June 1861. From 1838-48 he was a teacher at Paris, and then became organist of the royal chapel at Turin. He wrote a large

CONCORD — CONCORDAT

number of vocal exercises which are still used in the teaching of music.

Concord, kōng'kərd, Mass., a town in Middlesex County, on the Concord River and on the Boston & M. R.R., 20 miles northwest of Boston; settled in 1635. It is situated in a beautiful rural district, and has several manufacturing establishments. Here is located the Massachusetts Reformatory. The town has an excellent public library, a national bank, and an assessed property valuation of over \$4,000,000. At the beginning of the Revolution the Americans had a large stock of arms and military stores at Concord. Gen. Gage, the British commander in Boston, hearing of this, sent a body of soldiers to destroy these stores, and on their way (19 April 1775) they fought the battle of Lexington, the first of the war. When they reached Concord, the same day, they destroyed what stores they could find, but were soon driven off by the Americans. Concord is celebrated as the home of many authors—of Ralph Waldo Emerson, Nathaniel Hawthorne, Henry David Thoreau, Amos Bronson Alcott, Louisa May Alcott, the poet William Ellery Channing, and others.

Concord, N. H., a city, capital of the State and county-seat of Merrimack County, on the Merrimack River, and on the Boston & M. R.R., 75 miles northwest of Boston. The city has an abundance of water-power, and manufactories of carriages, shoes, twine, electrical apparatus, silverware, leather goods, machine-shop products, etc. Near Concord are extensive quarries of a fine-grained white granite. There are three national banks with a combined capital of \$500,000 and a surplus of \$300,000, and several private banking houses. The assessed property valuation exceeds \$20,000,000. The city is well laid out, has finely shaded streets, is well lighted, and its water-works are excellently constructed. The noteworthy buildings include the State-house, a fine building of Concord granite, the city hall and courthouse, the State prison, State insane asylum, and the United States government buildings. The public schools are admirably organized and conducted, and represent a property valued at more than \$325,000. This city is the seat of the well-known St. Paul's School (Episcopal) for boys. Concord was settled by whites in 1725, on the site of the Indian village of Pennacook. It was called by this name until 1733, then incorporated as the town of Rumford, and became a city in 1853. It is noted as the place near where Hannah Dustin (q.v.) made her escape from Indian captors. Pop. (1900) 19,632.

Concord, N. C., a city and county-seat of Cabarrus County, on the Southern R.R. Here are large industrial interests, and among the principal manufactures are those of cotton goods, foundry and machine-shop products, etc. There are also roller mills, a cannon manufactory, and brick works. Concord is an old place to which in recent years new industries have brought rapid growth. Pop. (1890) 4,339; (1903) about 9,000.

Concord, kōng'kōrd, an expression used in music denoting the combination of two or more sounds pleasing to the ear, and requiring no further combination before or after it to make it so. Concords are the eighth (or octave),

the fifth, third, and sixth. Their ratios are 2:1, 3:2, 5:4, 5:3. The two first are called perfect, because as concords they are not liable to any alteration by sharps or flats. The two last are called imperfect, as being alterable. The fourth is considered as a discord by some authorities; as a component part of an inversion of the perfect chord it may be classed among the concords. See COUNTERPOINT.

Concord, Book of (*Liber Concordia*), the name given to a collection of confessions of faith which are generally accepted by the Lutheran Church. The Formula of Concord (1580) was the result of a series of conferences and discussions upon the following subjects: The Rule of Faith and the Creed; Original Sin; Free Will; Justification; Good Works; The Law and the Gospel; The Third Use of the Law; The Lord's Supper; The Person of Christ; The Descent of Christ into Hell; The Customs of the Church; Predestination and Election; Heresies and Sectaries. The whole received the sanction of a large number of the Germans. Other subjects treated in the Book of Concord are: The Three Ecumenical Creeds—Apostles, Nicene, and Athanasian; The Six Particular Confessions of the Lutheran Church—Augsburg, Apology of the Augsburg, Schmalkald Articles, Catechisms of Luther (larger and smaller).

Concor'dance, a book in which the more important words of a volume or collection of writings are arranged alphabetically, part of a passage being extracted with each and the place of its use specifically given. The first known concordance of the Bible in any language was that of St. Anthony of Padua, who was born in 1195, and died in 1231. His work was called ('Concordantiæ Morales,') and was of the Latin Vulgate. It formed the basis of a more elaborate concordance, also of the Vulgate, that of Hugo de Santo Caro, better known as Cardinal Hugo. This was published in 1244 A.D. The first Hebrew concordance was that of Rabbi Mordecai Nathan, begun in 1438 and finished in 1448. The first Greek concordance to the New Testament was that of of Xystus Betuleius, whose real name was Birck; it came forth in 1546 A.D. The first English concordance to the New Testament was that of Thomas Gybson, before 1540 A.D.; the first to the whole English version of the Bible that of Marbeck, 1550 A.D. These, of course, preceded the appearance in 1611 A.D. of the authorized version of the Bible. The elaborate and well-known work of Cruden appeared first in 1737.

The first known concordance to Shakespeare was that of Ayscough, in 1790. Mrs. Mary Cowden Clarke's elaborate and most useful work was first published in London in 1845, and in 1894 appeared a still more excellent one, that of John Bartlett, published in New York. A concordance to Milton was published in Madras in 1856 and 1857, and one to Tennyson in London in 1870.

Concordat, kōn-kōr'dāt (*concordatum*, or, plur., *concordata*), a compact or convention entered into by the Holy See and a secular government to determine their respective powers and rights in the regulation of ecclesiastical affairs within the jurisdiction of the state which is a party to the compact. The earliest example of such compacts is the convention between Calix-

CONCORDIA — CONCRETE

tus II. and the Emperor Henry V., concluded at Worms in 1122: it marked the end of the great dispute about investitures. In 1448 was concluded the so-called concordat with the German nation, or with the Emperor Frederic III., under which the patronage of ecclesiastical dignities in the empire was divided between the imperial crown and the holy see. Memorable is the concordat of 1515 between Leo X. and Francis I.; the king agreed to annul the pragmatic sanction of Charles VII., which restricted the right of appeal to Rome; and in return the Pope conceded to the king the right of nomination to all Church benefices within the realm, with a reservation of the *annates* to the holy see, and with the proviso that the nominees should be acceptable to the Pope. Another celebrated concordat is that concluded 15 July 1801 between Pius VII. and Napolcon as first consul: it recognizes the legal existence of the Catholic Church in France which had been annulled by the revolution. The ecclesiastical topography of France was altered, the number of episcopal sees being reduced from more than 100 to 80. The confiscation of ecclesiastical property by the republican government was to pass for *fait accompli* and *res judicata* and the Pope and his successors were not to move to disturb purchasers or grantees of such properties. The government was to have the right of nomination of bishops, but the Pope that of canonical institution. Provision was to be made by the state for the support of bishops and clergy in lieu of their property, which had been appropriated by the Revolutionary Government. Ever since the concordat was concluded there has been in France an agitation for its abrogation, and this agitation was never more insistent than in 1903.

Concor'dia, or **Concord**, personified and worshipped as a goddess in Rome, where she had several temples, the most important of which was that in the forum, erected by Camillus. An annual feast was celebrated in her honor 16 January. She was represented with wreaths of flowers on her head, and in one hand a cornucopia, in the other an olive branch or a *patra*.

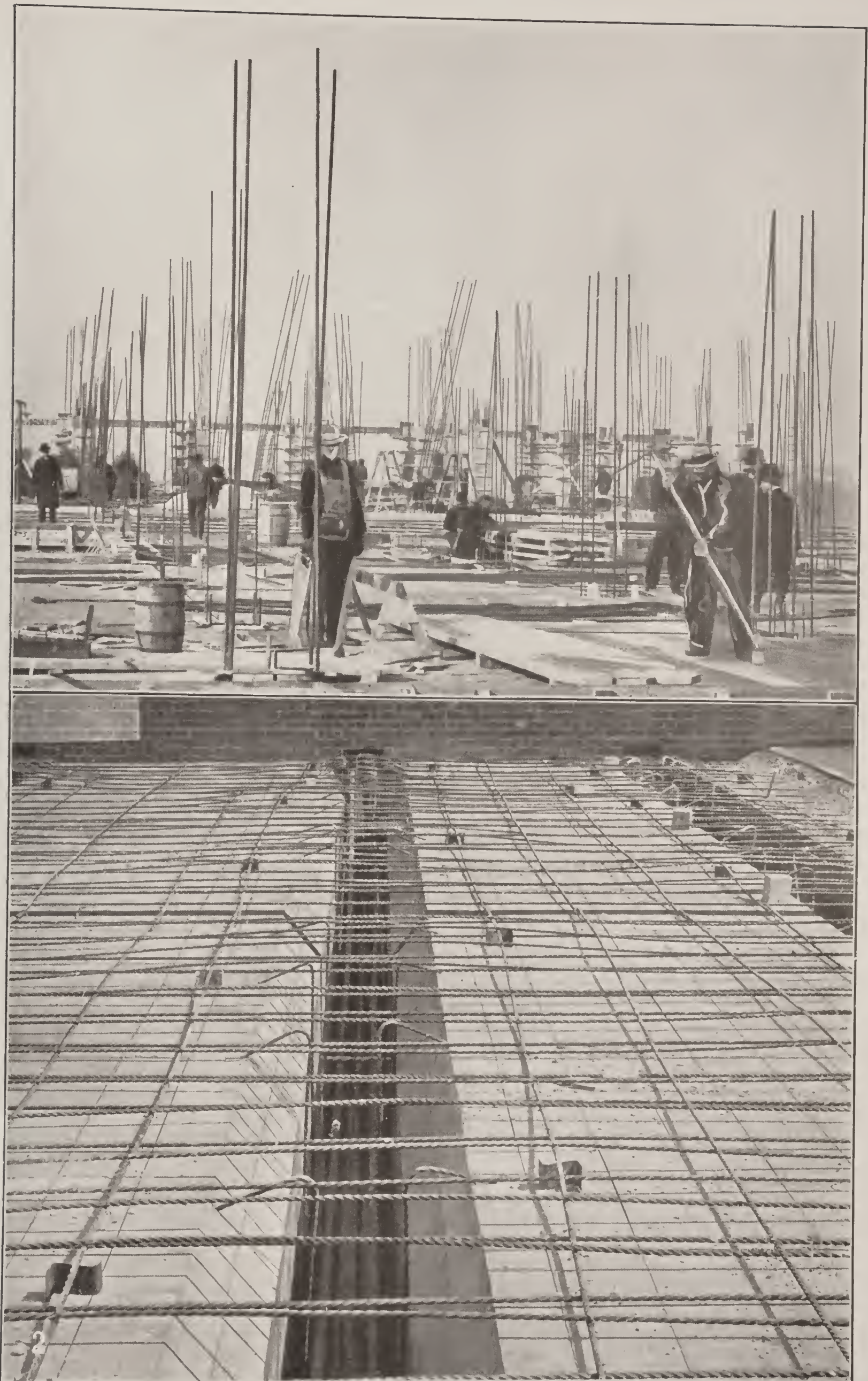
Concor'dia, Kans., a city and county-seat of Cloud County, situated on the Republican River and on the Atchison, T. & St. F.; the Missouri Pac.; and the Union Pac. R.R.'s, 110 miles northwest of Topeka. It has good water power and shows considerable manufacturing activity. There are iron-works and flour-mills and factories for making plows, wagons and cigars. Nazareth Academy is located here, and there is a United States land office. Pop. (1900) 3,400.

Concordia, kōn-kōr-dē'ä, Argentine Republic, a town of the state of Entre Rios, on the Uruguay, 302 miles north of Buenos Ayres by river. It has a custom-house and a river trade exceeded only by that of Buenos Ayres and Rosario, exporting salted meat and Paraguay tea. It has railway connection with Paraná, Uruguay, and South Brazil. Pop. about 13,000.

Concor'dia College, an educational institution in Fort Wayne, Ind., organized in 1839 under the auspices of the Lutheran Church; reported at the end of 1905: Professors and instructors, 10; students, 230; volumes in the library, 10,000; grounds and buildings valued at \$100,000; income, \$12,400; number of graduates, 950.

Concrete (Lat. "to grow together"), an artificial stone, a composition of hydraulic cement, sand and broken stone, used for foundations, especially submarine, and now more and more in place of building stone even when exposed to the air. In place of hydraulic cement pure lime was originally used and the name concrete applied only to this compound, "beton" being the proper term for the composition based on hydraulic cement until it became the only method. The mixture of sand and cement is termed the matrix, and the broken stone or other addition is styled aggregate and is composed of slag, coke, broken bricks, gravel or pebbles. The ideal aggregate is broken, sharply angular and irregular stone, as this material mixes better with the matrix than rounded pebbles, minute particles of gravel, or the more spongy brick, shell or coke, although broken stone or gravel may be used advantageously in connection with pebbles, even in such small proportion as 3 to 5. Broken limestone is considered especially efficacious as an aggregate, possibly because of an affinity between the molecules of carbonate of lime in it and the matrix. The proportions of the various parts approximate 1 part of cement, 1 to 3 parts of sand, and 4 to 6 parts of aggregate, but no fixed norm is to be followed the true rule being that the cement paste is to be thoroughly incorporated with sand coating each particle and that the matrix thus formed shall fill all interstices in the aggregate. In the process of mixture there are two extreme methods of watering, one very wet and the other scarcely more than moist. The spraying is followed by a mixture by shovel or by mixing machines. These machines are of two types: continuous, a trough or cylinder with a revolving screw shaft which works until the mixture is complete; and intermittent, a box being rotated slowly. The concrete is most commonly made into blocks, one layer of comparatively small depth being made at a time. By the newer method it is applied to its place on the building or foundation in the soft state and allowed to harden there. For submarine construction the concrete is usually sent under water in bags, which break because of pressure, or in closed chutes. While concrete is a comparatively modern invention, it was employed in ancient times, and in some of the most renowned works of history. The factitious stones employed by the Babylonians and the early Egyptians, as well as among the Greeks and Romans, and at the present day in Barbary and among the nations of Malabar, were all a species of beton. Pliny mentions that the columns which adorn the peristyle of the Egyptian labyrinth were of this material, and the great length of time it has existed (over 3,600 years) shows the durability of this mode of construction. In Rome the pyramid of Ninus is formed of a single block, as was also the square stone that formed the tomb of Porsena, which was 30 feet wide by 5 feet high. The Romans made free use of this material in constructing their walls, aqueducts, piers, and roads, many portions of which exist at the present day. The mole which shelters the harbor of Algiers is so much exposed to the effect of winds that breaches were continually being made in it by the force of the sea, and to such an extent that in former times the Moors were compelled to employ a large number of workmen constantly repairing it, at an annual

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expenditure of over \$60,000. When the French commenced the reconstruction of the mole in 1833, after the failure of partial repairs, the first operation was to raise an outer embankment of large stones, under whose cover the foundation might be properly restored, it being intended to form this embankment of *pierre perdue*, that is, of stones thrown in at random, and allowed to arrange themselves to the necessary slope for equilibrium by the action of the sea. But during the first ensuing winter the embankment was completely destroyed by the action of the waves, one block of 141 cubic feet having been carried completely across the mouth of the harbor. This rendered it necessary to rebuild the entire embankment of blocks so large that no action of the sea could move them; this was of course possible, since the action is proportioned to the surface struck, while the resistance of the block increases as its mass, and there must necessarily be a point where the latter predominates; this was found on trial to be about 353 feet. The expense of quarrying and transporting such enormous blocks of stone, led to the employment of artificial stone or beton. Two kinds of blocks were manufactured: the first in the water, in the place they were intended to occupy, and the second on shore, to be afterward thrown into the sea. In the process of reconstruction, these blocks were used as follows: Those of the first kind, made in lined caissons, formed an outer sea line; on these blocks molds were placed filled with beton, and after these second blocks had set, they were launched into the sea, forming a line in front of the first; the intervening space was then filled up with blocks of natural stone. Behind this embankment thus formed, the ground was dredged to a depth of over six feet, and the whole of this space filled up with a continuous mass of beton. The entire work was performed in five years, at a cost of less than \$420,000, notwithstanding that the mole, at the time of the occupation of Algiers by the French army in 1830, was in a state of complete dilapidation, in spite of the extensive repairs which had been annually executed upon it by the Moors during a period of two centuries. Marine works of the above character present numerous advantages over constructions in which natural stone is employed, of which the following are some of the most prominent: (1) immediate stability, while ordinary *pierre perdue* is never secure; (2) incomparably greater facility in transportation, which is always expensive and troublesome when blocks of stone are to be quarried exceeding 100 cubic feet; (3) a considerable reduction in the sectional area of the pier, and consequent economy of cost; and (4) that the system can be applied in every locality, now that our advanced knowledge of the subject of hydraulic mortars enables us to manufacture beton in any place where it may be needed. On the use of concrete in modern building consult I. O. Baker, 'Treatise on Masonry Construction' (1900).

Concrete Construction. The use of concrete for purposes of construction, while not entirely a new idea, has within the last few years received an enormous impetus, and its use for all kinds of engineering construction has been thoroughly tested by American engineers. As a substitute for stone, steel, hollow tile, etc., its service has been demonstrated by a constantly increasing use. Concrete may be defined

as an artificial stone. It can be used for all structural purposes as a substitute for stone and in addition it has a wide variety of applications where the use of stone is impracticable.

Composition.—Concrete is composed of broken stone or gravel, sand and cement with the addition of water sufficient, after allowing for evaporating and absorption, to unite chemically with the cement. A typical concrete is made as follows: To one barrel of a standard Portland cement is added three barrels of clean sharp sand. The two are intimately mixed—either manually or by a mechanical mixer—and then enough water is added to bring the mixture to a certain consistency, the proper amount of water being readily judged by one experienced in this work. Five barrels of broken stone are then added, the whole thoroughly intermixed and the concrete thus formed is ready to be conveyed to the forms or the excavations prepared for it. Concrete made in the above proportions would be known as a 1:3:5 mixture. The permissible proportions, however, vary widely from 1:2:4 to 1:5:10 according to the nature of the ingredients and the service for which it is intended. In general, the concrete with the smaller proportion of cement will not sustain the same strains as the concretes wherein the proportions are about as indicated in our typical mixture.

The composition of a properly proportioned concrete may be thus considered; sand fills up the interstices between the pieces of rock, and the cement, in turn, fills up the interstices between the particles of sand and between the sand and the rock. As 90 per cent of a standard cement will pass through a sieve of 10,000 meshes to the square inch, it is evident that the cement will effectually fill up all the voids. But the cement also performs an even more important function. It enters into chemical combination with the water used in mixing and acts as a binder, tenaciously holding the whole mass together. As soon as the cement is mixed with water this chemical change commences, or the concrete begins to "set" as it is generally expressed. Therefore the concrete must be put in place immediately after mixing. At the end of about three or four days, the concrete is solid enough for the supporting forms to be removed and after possibly thirty days it is ready for the loads for which it is designed. The hardening continues for months and the concrete becomes stronger as time elapses.

Merits and Advantages.—Concrete as a material for construction has been known for centuries. Some of the most enduring monuments of antiquity are constructed either wholly or in part of this material. The dome of the Pantheon, erected at the beginning of the Christian era, is built of concrete, as are some of the other historic structures of that period. Concrete has ever since been used to a greater or less extent. With the discovery and application of the methods of making Portland cement, which we may ascribe to the period 1820-50, concrete assumed its place as one of the principal materials of engineering and we may say that each year has shown an increase in the amount of concrete construction with a constant widening of the field of its application. Concrete reinforced with steel, has been successfully used in office buildings, apartment houses, theatres, schools, court-houses, public libraries, factories,

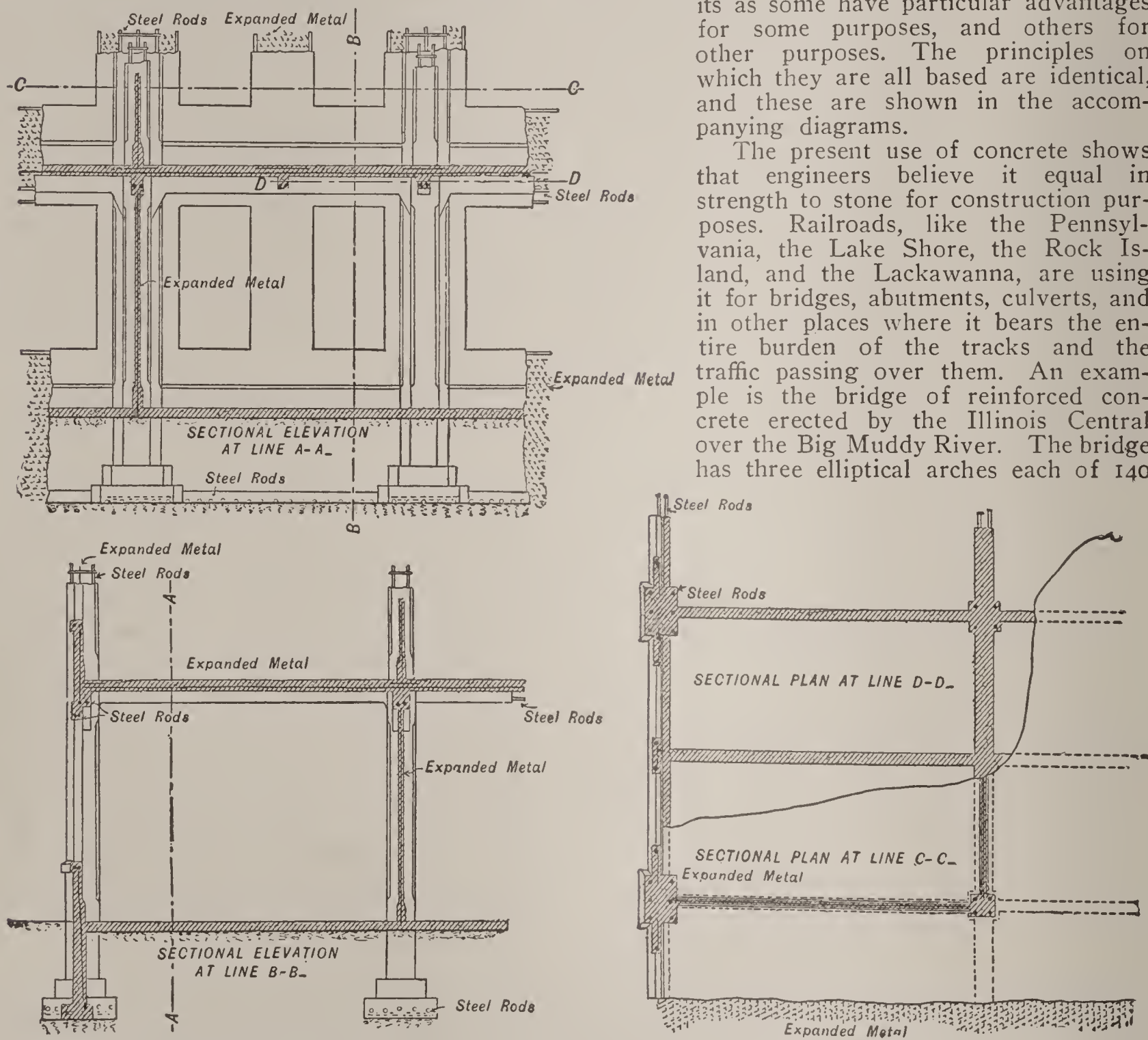
CONCRETE CONSTRUCTION

mills, warehouses, foundries, grain elevators, stables, cisterns, bins, stand-pipes, bridges, culverts, abutments, sea-walls, breakwaters, jetties, piers, reservoirs, tanks, dams, aqueducts, sewers, subways, dust-chambers, and chimneys, besides a great number of minor uses in buildings constructed primarily of other material.

The fact that concrete can be molded into any form desired is a most valuable quality and one which is largely availed of in practice. Aside from such uses as being simply deposited for foundations, abutments, etc., it is molded into shapes as intricate as may be desired, one of the recent applications which is being exten-

predicted. Concrete will withstand enormous compression strains. When heavy strains other than those of compression are to be provided for, the concrete is so strengthened with steel that the metal takes the tensile and shearing strains, and the concrete the compression strains. This construction, known as armored or reinforced concrete, is rendered entirely feasible by the facts that concrete has considerable adhesion for iron and steel, and the co-efficients of expansion (by heat) of the two materials are practically identical. There are a number of "systems" of reinforcing concrete with steel. We need not here discuss their relative merits as some have particular advantages for some purposes, and others for other purposes. The principles on which they are all based are identical, and these are shown in the accompanying diagrams.

The present use of concrete shows that engineers believe it equal in strength to stone for construction purposes. Railroads, like the Pennsylvania, the Lake Shore, the Rock Island, and the Lackawanna, are using it for bridges, abutments, culverts, and in other places where it bears the entire burden of the tracks and the traffic passing over them. An example is the bridge of reinforced concrete erected by the Illinois Central over the Big Muddy River. The bridge has three elliptical arches each of 140



Reinforced Concrete Building Sections Showing Column, Pilaster, Floor Beam, Girder, Footing, Curtain Wall and Partition Construction.

sively developed at the present time being the use of concrete for making hollow blocks for building purposes. The facility with which it can be molded for producing decorative effects, is, of course, well known. Another highly important advantage resulting from the plasticity of the newly-mixed concrete is that other materials, such as iron, may be imbedded in it.

The strength and durability of all concrete depend, of course, upon the quality of the ingredients and the care exercised in mixing and handling. When the work is done under experienced supervision, however, the characteristics of the resulting concrete can be accurately

feet clear span. It was erected at less cost than a bridge of structural steel, it is more enduring and is decidedly more pleasing to the eye. A typical bridge of concrete alone, built on the straight masonry principle, is that of the Pennsylvania Railroad over the Susquehanna River, near Harrisburg, Pa. This structure is faced with a thin veneer of natural stone, which is not, however, an essential part of the structure. The United States government is using concrete in enormous quantities for all sorts of purposes. In the reconstruction of the fortifications around New York harbor during the last few years, concrete has been used to the practical exclusion

CONCRETE CONSTRUCTION

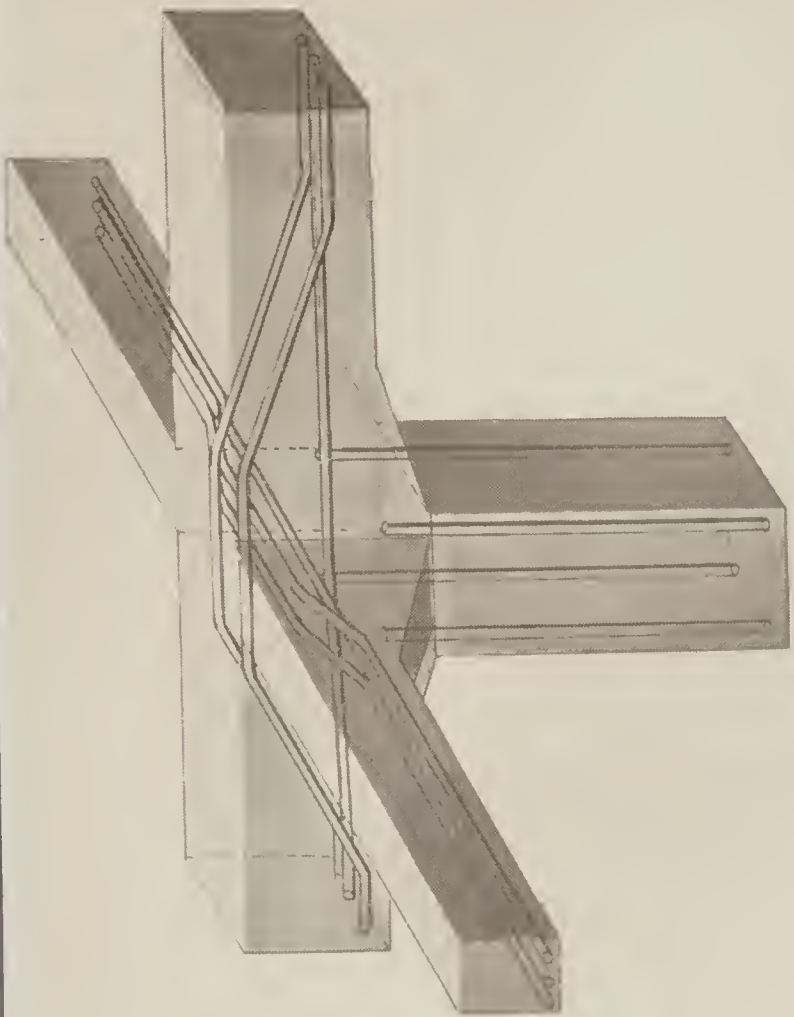


FIG. 3.



FIG. 5.



FIG. 1.

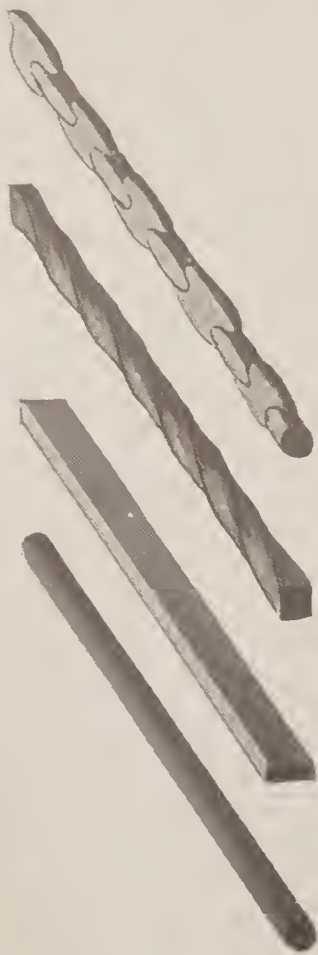


FIG. 2.

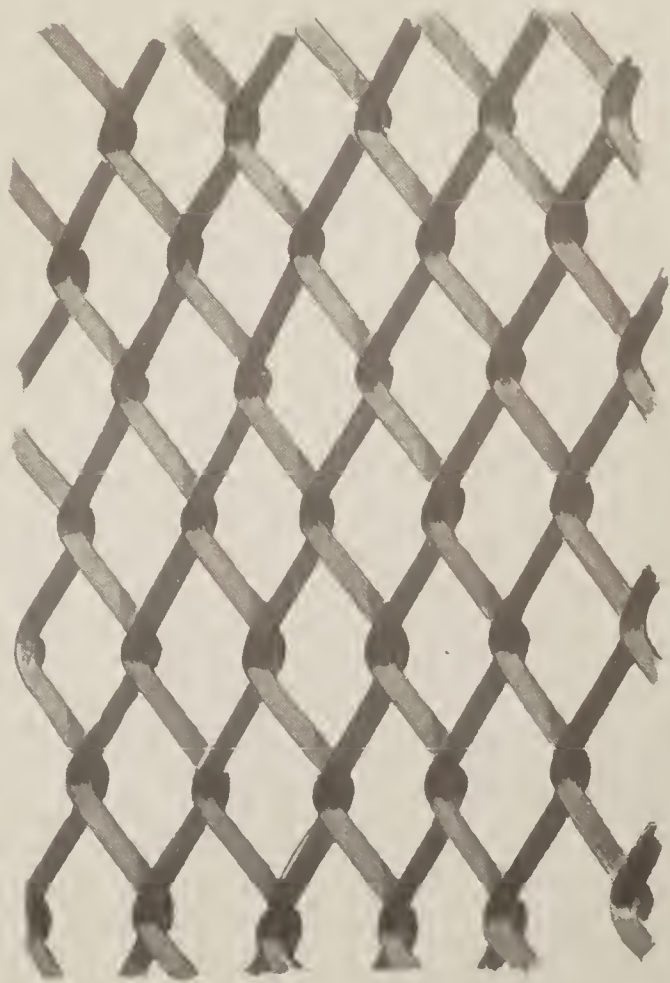


FIG. 4.

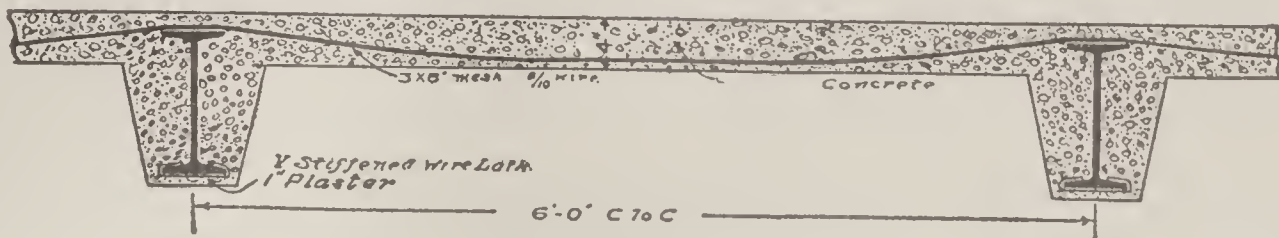
CONCRETE CONSTRUCTION

of all other materials. In other words, the 13-inch guns which guard the City of Steel-frame Skyscrapers are mounted on concrete foundations and are protected from hostile projectiles by the same material. The Ingalls Building, Cincinnati, Ohio, 16 stories high, is made entirely of reinforced concrete. The plans for this building were approved by the city authorities only after a great number of tests had been made which proved beyond the possibility of doubt that the building would be absolutely safe. Concrete enthusiasts predict that this building will be standing long after the steel skeleton structures in the neighborhood have disintegrated. The deterioration of steel when pro-

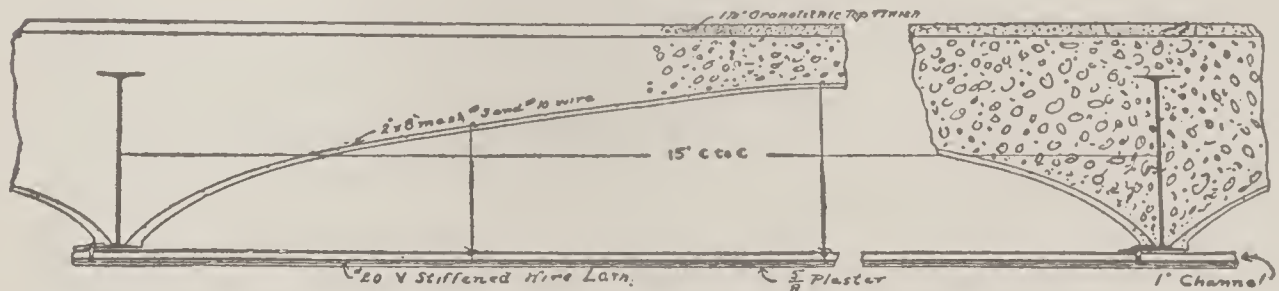
for from 10 to 15 years, showed no signs of rust or other external deterioration. A lining of "rich" concrete has been found to be the only material which will withstand the corrosive action of the acids in the large storage tanks or vats at pulp mills.

As regards the all-essential quality of ability to resist fire, concrete is absolutely and unqualifiedly superior to all other building materials. This has been shown many times in tests conducted by the building and fire departments of various large cities in this country and abroad. The usual way of conducting such tests is to build a small structure of concrete and to maintain therein a fire of a temperature of about

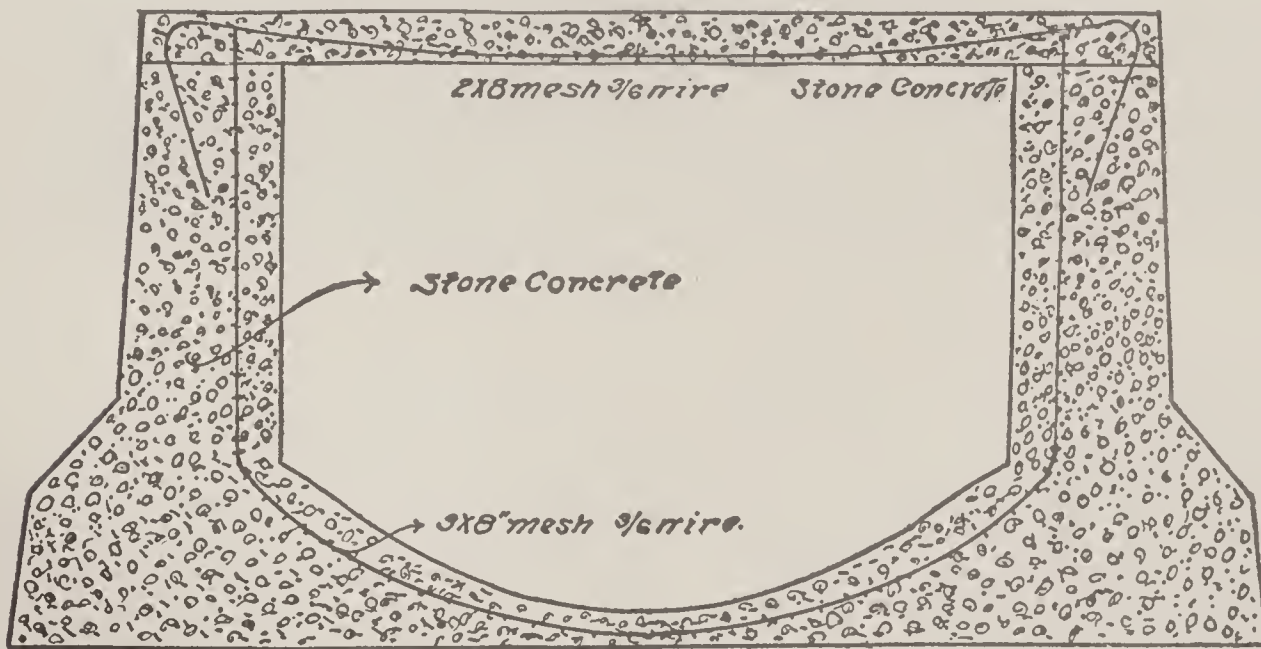
EXAMPLES OF REINFORCEMENT WITH ELECTRICALLY WELDED WIRE FABRIC.



Floor construction with I-beams.



Floor construction, with ceiling clipped to I-beams.



Method of reinforcing water-mains, sewers, etc.

tected by nothing more than terra-cotta slabs, noted in a number of cases, tends to lend strength to this view. In fact, superior durability is one of the best-substantiated claims for concrete buildings. It has long been recognized that concrete becomes stronger with age, and the same is not true of any other material. Engineers are divided in their estimates as to how long a steel-framed structure will endure.

In reinforced concrete construction the steel is completely imbedded in the concrete which absolutely protects it from fire as indeed it does from rust and all other corrosive action. It has been demonstrated in several instances that cast-iron piping which has been covered with a coat of liquid neat cement and buried underground

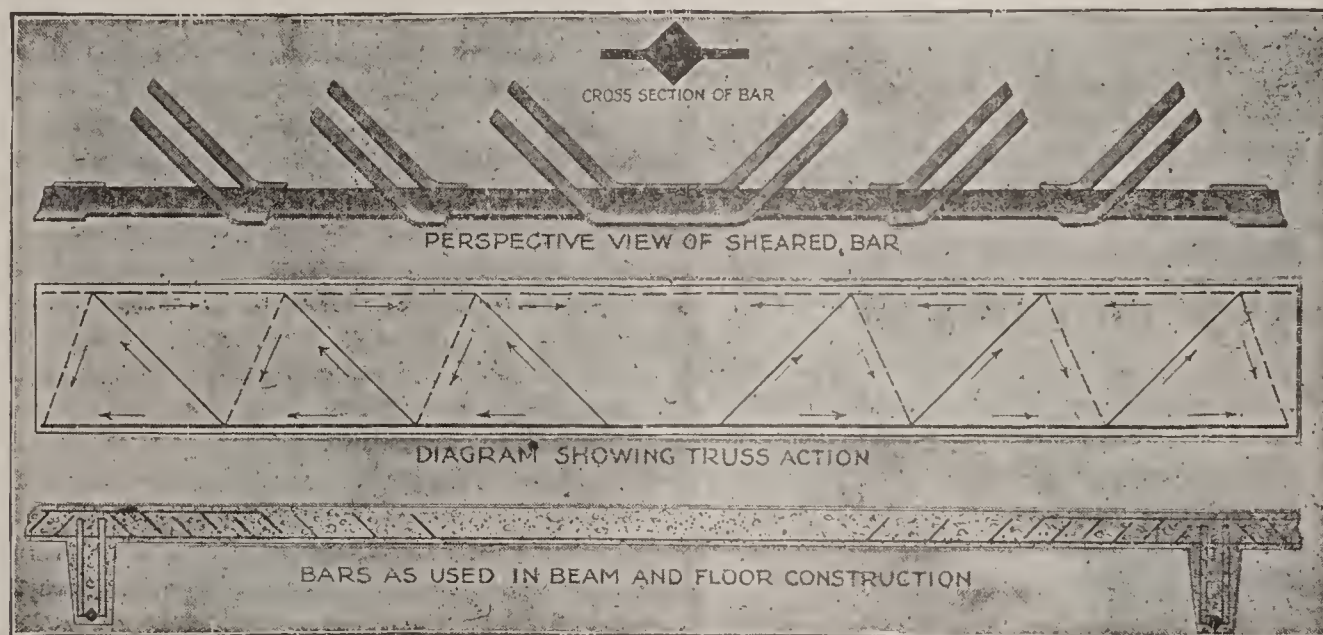
1,700° F. for a number of hours. A stream of water is then turned on the fire and concrete and results are carefully noted. In general, a few hair-like cracks in the concrete is the only effect noticeable, the strength of the material being unimpaired. In the great Baltimore conflagration every known type of construction was subjected to the flames. After the fire, engineers came from all over the country to observe what type of construction had best withstood the fire. The opinion of these experts was strikingly unanimous and decisive to the effect that concrete has stood up better than the steel frames with terra-cotta protection and, of course, better than brick and stone. Prof. Norton of the Massachusetts Institute of Technology re-

CONCRETIONARY STRUCTURE

flected the general expert opinion in his report to the 'Boston Transcript': "Stone, whether granite, marble, sandstone or limestone fared badly. Where floor arches and steel coverings were of concrete they stood the test much better than terra cotta. This was due probably to the fact that concrete and steel expand at the same rate while terra cotta expands $2\frac{1}{2}$ times as fast as steel and so the partitions or floor arches buckle or break. In general, the unfitness of terra cotta for beam and post covering and floor construction in comparison with concrete was demonstrated."

Cost.—It might be expected that a material with so many desirable qualities would be more expensive than the materials which it is displacing. The contrary is the case. Concrete is cheaper than stone, or steel frame and terra cotta. It can be manipulated by unskilled labor to a greater extent than any other material. There are many localities in the country where no stone suitable for building purposes exists, but where there is much stone admirably adapted for being crushed and used for concrete. In short, the raw materials for concrete can be laid

and more compact than the rest of the clay, and presenting forms in imitation of nuts, fruits, and different organic substances. The resemblance is so striking that common observers are satisfied that they see actual relics and petrifications instead of mere aggregations of inorganic matter. Through each one of these clay concretions a hole may be traced, which was at some time filled with a rootlet, the carbonaceous residue of which, if not the form of the root itself, may be observed. This appears to have been a nucleus around which the material collected, following the law of attraction by which neighboring particles of the same composition seek out and join with each other when in a medium that admits of their movement. In argillaceous deposits, even among the older stratified rocks, the same tendency appears to have obtained after the deposition of their materials. The calcareous portions separated from the shaly or sandy strata, and arranged themselves in these concretionary layers. But if the quantity of calcareous matter was sufficient to form a stratum of itself, this force appears not to have been exerted to produce the spheroidal



The trussed steel bar for concrete reinforcement.

down at almost any point in this country cheaper than any other material and the cost of putting it in place is less. It will therefore be seen that the strength and durability of concrete, the ease with which it may be reinforced with steel to form a combination of universal applicability, its fire-resisting and time-defying qualities and its low first cost, stamp it as the great construction material of the future.

R. H. JOHNSTON,
Of Engineering Company of America, New York.

Concretionary Structure. Among the strata of rocks formed by deposition of sediment it is a common thing to find lumps of material differing more or less in chemical composition from the strata in which they lie, and, though separated from each other by short intervals, still arranged in layers conforming to the general stratification. The balls of argillaceous iron ore found in the shales of the coal formation are examples of these concretions. They have no regular form, but are generally flattened spheroidal masses, and are commonly called "kidney-shaped." In the clay beds of the Tertiary group, in various parts of the country, are found curious collections of clay concretions, harder

masses; except occasionally the rock is said to have a concretionary structure when it displays a tendency to form here and there along its course bunches or knots, as if these parts had curled and rolled over, presenting very much such an appearance as is observed in very gnarled and knotty wood. In the shales of the Lower Secondary in New York State, particularly in those of the Hamilton and Portage groups, numerous dark-colored calcareous concretions are found of extraordinary size and forms. They abound along the shore of Lake Erie, washed out of the banks by the action of the waves. Very often they are formed about some nucleus of entirely different substance from their own as a fossil shell or a nodule of iron pyrites; and the fossil shell not infrequently has first served as a nucleus for an incrustation of pyrites, by which it was completely buried before both were concealed within the large concretionary mass. After the forming and hardening of the concretions, they appear to have cracked by shrinkage, the cracks sometimes radiating from the centre or taking other irregular directions. The cracks afterward became filled with light-colored clay or calcareous matter, and now appear like mineral veins. As the shape of these bodies often

CONCRETIONS — CONDE

approaches that of the large sea turtles, and the seams resemble the divisional lines of the plates of the shell, they are very naturally supposed by most people who meet with them to be the petrified remains of this animal; and looking at those specimens deposited in the State collection at Albany, one may well suppose that this common belief will not soon be corrected. At Erie and other places in this part of Pennsylvania, concretions in a light-blue limestone are found, which consist of a number of cones closely arranged side by side, and forming a thin layer not more than two inches thick, of which the flat base of the cones constitutes one side, and their points reach nearly through to the other. Little is known of the laws that have caused these matters thus to assume at different localities similar, and, as they appear, fantastic forms. Extraordinary clay concretions from the banks of the Park River in Hartford, Conn., are to be found in many museums.

Concretions, Morbid, in animal economy, hard substances that occasionally make their appearance in different parts of the body, as well in the solids as in those cavities destined to contain fluids; in the former case they are denominated concretions or ossifications; in the latter, calculi. The concretions are named from the parts of the body in which they occur. Pineal concretions, from their being found in that part of the brain called the pineal gland, consist of carbonate and phosphate of calcium with organic matter; salivary concretions, as being discovered occasionally in the salivary glands, also consist mainly of earthy phosphates; pancreatic concretions are hard substances found in the pancreas; pulmonary concretions, which have been sometimes coughed up by consumptive persons, contain mucus and albumen in addition to the salts; hepatic concretions, of which the liver is sometimes full, are composed chiefly of cholesterin, mucus, and coloring matter; urinary concretions are found in the bladder, and their constituents are very variable, uric acid, urates, fibrin, oxalates, phosphates, and several other bodies being found. Gouty concretions consist of urate of sodium and small quantities of other salts with organic matter. Concretions have been discovered in the intestines and stomach of man, but more frequently in the bodies of other animals. Those found in the intestines of a horse were examined by Fourcroy, and found to consist of magnesia, phosphoric acid, ammonia, water, and animal matter. See **CALCULUS**.

Concu'binage, the cohabitation of a man with a concubine. Among the Greeks concubinage was allowed even to married men: the number of their concubines, also, was unlimited. Among the Romans concubinage was neither unlawful nor disgraceful. It was moreover, formally permitted to unmarried men by the Lex Julia, and by the Lex Papia Poppæa, but with the provision that it should be limited to a single concubine, and that only women of mean descent, as freed women, actresses, and the like, should be chosen for the purpose. The children begotten in concubinage were not considered as legitimate, but were called natural, and the right of inheritance of the concubine and her children was very much limited. With the introduction of Christianity concubinage ceased; and, indeed, Constantine the Great made

laws intended to put a stop to it. Concubinage also signifies a marriage with a woman of inferior condition, to whom the husband does not convey his rank. By French law the presence of a concubine in the house entitles the wife to a divorce. The term is used in a more general sense to mean the cohabiting of a man and woman who are not legally married.

Concurrent Jurisdiction, the jurisdiction of different courts authorized to take cognizance of the same case. In criminal cases the court which first takes up a case has what is called the right of prevention, that is, the right of deciding upon that case exclusive of the other courts, which but for that right would have been equally entitled to take cognizance of it. In civil cases it lies with the suitor to bring his cause before any court he pleases, which is competent to take it up. Concurrent, also called cumulative, jurisdiction is opposed to privative jurisdiction.

Concussion of the Brain, a term applied to certain injuries of the brain resulting from blows and falls, though unattended with fracture of the skull. Stupor or insensibility, sickness, impeded respiration, and irregular pulse are the first symptoms, and though these may subside there is always for a time more or less risk of serious inflammation of the brain setting in. The patient should be put to bed at once with the head low, and kept warm; but stimulants should, except in special cases, be withheld. All excitement should be avoided, and for some time after apparent recovery great care is necessary.

Condé, kôn-dā, the name of a French family, the younger branch of the Bourbons, who took their name from the town of Condé, department of Nord. One Godfrey de Condé, about 1200, was in possession of a part of the barony of Condé. His great-granddaughter, Jeanne de Condé, married in 1335, Jacques de Bourbon, Comte de la Marche, and the barony of Condé went to their second son, Louis de Bourbon, Comte de Vendôme, whose great-grandson, Louis de Bourbon, Prince of Condé, in virtue of his blood-relationship to the royal family, assumed the title of Prince, and is regarded as the founder of the new house of this name.

Condé, Henri (õn-rē) II. de Bourbon, PRINCE DE: b. 1588; d. 1646. At the request of Henry IV. he became a Catholic. In 1616 he was sent to the Bastille, where he remained for three years. After the death of Louis XIII. the prince was liberated, and was made minister of state to the regent.

Condé, Louis (loo-ē) I. de Bourbon, boor bôn, PRINCE DE, French general: b. Vendôme 7 May 1530; d. 15 May 1569. He married the grandniece of the Constable de Montmorenci. He served his early campaigns in Piedmont, but first distinguished himself at the defense of Metz, besieged by Charles V. in 1552. Affronted at court, and hated by the Guises, he joined his brother, the king of Navarre, at Nérac, and became a Protestant. In 1560 he was arrested and sentenced to death, but was discharged after the death of Francis I. He soon after appeared as head of the Protestants, and was defeated and captured at the battle of Dreux. In 1567 he fought the battle of St. Denis without decisive result. Two years later the Protestants were defeated, and Condé was slain at Jarnac.

CONDÉ — CONDENSED MILK

Condé, Louis II. de Bourbon, PRINCE OF, French general: b. Paris 8 Sept. 1621; d. near Fontainebleau 11 Dec. 1686. He was the son of Henri II., Prince de Condé (q.v.) and during the life of his father bore the title of Duc d'Enghien. He immortalized this name at the battle of Rocroi, in which, at the age of 22, he defeated the Spaniards (1643). Wherever he appeared he was victorious. He besieged Dunkirk in sight of the Spanish army, and gained this place for France in 1646. During the troubles of the Fronde he at first took the side of the court against the parliament and the nobles, and after a siege of a few months brought back the young Louis XIV. to Paris (1649); but believing himself ill requited by Mazarin for his services he put himself at the head of the faction of the *Petits Maîtres*. Being captured, however, he was imprisoned by Mazarin (1650), and was not released till after the lapse of a year. He at once put himself at the head of a new Fronde, and entered upon negotiations with Spain. In spite of several checks he then marched upon Paris, where he was met and opposed in the suburb St. Antoine (1652). The battle which ensued was indecisive; and Condé, finding himself abandoned by many of his friends, retired to the Netherlands, and joined the Spaniards, who appointed him generalissimo of the Spanish armies. In 1658 he was defeated before Dunkirk, by Turenne, and was only restored to royal favor by the Peace of the Pyrenees in 1659. In 1668 he was charged with the reduction of Franche Comté (then belonging to Spain), which he accomplished in three weeks; and in 1674, at the head of an army sent by Louis XIV. against the United Provinces, defeated the Prince of Orange (afterward William III. of England) at Senef. He was unable, however, to take advantage of this victory, as he was obliged to withdraw into Alsace to defend it against Montecuculi, to whom it was thrown open by the death of Turenne in 1675. He succeeded in driving Montecuculi across the Rhine. This was his last triumph. Four years later he retired to Chantilly, near Paris, where he devoted himself to the sciences.

Condé, Louis Joseph (loo-ē zhō zěf) de Bourbon, PRINCE OF: b. Chantilly 9 Aug. 1736; d. Paris 13 May 1818. In the Seven Years' war he distinguished himself by his courage and skill, and afterward formed in 1792, at Worms, a little corps of emigrant nobility, which joined the Austrian army under Wurmser. In 1795 he entered with his corps into the English service. In 1797 he entered the Russian service, but in 1800, after the separation of Russia from the coalition, reentered the English service. The campaign of 1800 ended the military career of the prince. He returned to Paris in 1814; where, being appointed president of a bureau of the chamber of peers, he remained some time, but at last retired to Chantilly. He published: 'Essai sur la Vie du Grand Condé, par L. J. de Bourbon, son 4me Descendant' (1806).

Condell, kün'děl, Henry, English actor: d. Fulham, England, December 1627. With John Heming (q.v.) he edited the famous first edition of Shakespeare's plays, 1623. He belonged, as did Shakespeare, to the lord chamberlain's company of players and is named in Shakespeare's will.

Condensa'tion, the reduction of anything to another and denser form, as of a vapor or gas to a liquid, or a liquid to a solid; the passage of gases or vapors from the aëriform to the liquid state. It is sometimes called also the liquefaction of vapors. It may be due to one of three causes: cooling, compression, or chemical affinity. Before the first or second of these causes can operate, the vapor must be saturated. Various salts also condense vapors by means of chemical affinity. When vapors are condensed their latent heat becomes free. The condensation of liquids is the reduction of a liquid to smaller bulk, with a proportionate increase in the specific gravity.

Condensed Milk, Definition. Condensed milk as generally manufactured and sold fresh daily for delivery to consumers is pure cow's milk reduced in volume by the evaporation of water in vacuum. No other constituent part of the milk is removed. This article is not put up in hermetically sealed cans nor intended for long-distance shipments.

Condensed Milk, Preserved, as generally manufactured and sold is pure cow's milk reduced as above, but having refined granulated sugar added in proper proportion for the purpose of preservation.

Condensed Skimmed Milk is prepared by removing all or part of the butter fats and then reducing in volume as above described. The dairy laws of various States and the rulings of boards of health are, however, designed to prevent its manufacture and sale.

Evaporated Cream is a trade name established by usage for unsweetened condensed milk sold in hermetically sealed cans which is condensed to a creamy consistency. It is prepared by removing water only and by means of the vacuum process. It is sterilized after the cans are sealed and will keep indefinitely in any climate, being very little affected by heat or cold, dryness or dampness.

Early Experiments.—The first application of a practical process for condensing milk was made by Gail Borden, who was born in Norwich, N. Y., in 1801, and at the time of his experiments a resident of New York, through his adaptation of the vacuum evaporating process on original lines. Most of the earlier experiments of previous investigators were what might be called "open process." The earliest known patents for reducing the volume of milk or attempting to preserve it are the following:

Newton, 1835.—For evaporating "in any known mode," alludes to the vacuum pan as affording a good method of introducing warm air through the milk!

De Lignac, 1847.—Evaporating in large, flat, shallow pans, heated by steam bath to 186 degrees F.; product put in tins, sealed, and again heated to 210 degrees F.

Grimwade, 1847.—Preserving milk by "the mixing of saltpetre with the milk, and then exposing it to heat in vacuo, so as to evaporate and extract the aqueous particles thereof," and then enclosing "in bottles from which the air has been previously exhausted." Never put in practice.

Louis, 1848.—Evaporating in shallow pans, with steam jackets, etc.

Grimwade, 1855.—Carbonate of soda or potash is first added and the milk then evaporated in pans with agitation until a doughlike substance is obtained; sugar is then added, and the mass pressed by rollers into ribbons, further dried, and then pulverized. Practiced for some years.

Cooke, 1855.—Evaporating in steam evaporating pans.

CONDENSED MILK

Borden, 1856.—In vacuo, put into successful practice and has superseded all others.

House, 1857.—Substantially like De Lignac's, except evaporating at lower temperature.

Gail Borden's experiments began shortly after 1851 and his first application for a U. S. patent was made in 1853 which was at first rejected on the ground that it lacked novelty and usefulness. The patent, however (No. 15,553), was granted 19 Aug. 1856 on the following claim:

Producing concentrated sweet milk by evaporation in vacuo, substantially as set forth,—the same having no sugar or other foreign matter mixed with it.

This was followed by other patents: No. 1,306, dated 13 May 1862; No. 1,389, dated 10 Feb. 1863; No. 2,103, dated 14 Nov. 1865; No. 2,226, dated 17 April 1866. Every feature of Borden's various claims as well as the state of the art was carefully and thoroughly investigated by the patent office examiners.

Necessary Sanitary Regulations.—Experience covering a period of over half a century establishes the fact that the sanitary precautions surrounding the manufacture of condensed milk, evaporated cream, etc., are the most stringent and necessarily so because the safety of the business depends on thoroughness. Not only are the cattle inspected by competent veterinaries, but rules and regulations of the strictest kind provide for the cleanliness of these cattle, proper feeding of wholesome, non-fermenting foods, cleanliness of stables, the isolation of the milk-room, cooling facilities, in fact every well tested plan that facilitates the production of pure, rich milk handled in the most cleanly manner. While seemingly these rigid requirements involve some extra expense on the part of the dairyman, he is more than compensated by having a steady, firm market for his product at better prices than he can get anywhere else. The consumer is benefited by obtaining a pure and uncontaminated product at a most reasonable price. There are concerns, of course, in the business whose facilities and experience do not enable them to perform all of this work as thoroughly as the older concerns who have been at it many years.

The Receiving Platform is an interesting sight, for as the farmers deliver their cans of milk each is examined by a trained inspector and tested; if not found to be up to the standard required by the company, it is rejected. From the receiving room the milk is drawn into what is called the "well-room," where the preliminary heating is done in peculiarly constructed heating wells, and if it is to be preserved milk, the necessary sugar is dissolved and mixed with it. From this point it goes to the vacuum pan where the condensing process takes place in accordance with formula as to temperature, vacuum, etc., as found by the manufacturers to be best qualified for making the various grades. The water is removed more or less to obtain a certain density. From the vacuum pan it is drawn into cans and cooled to the desired temperature. From this point, if it is to be condensed milk, it is ready for canning and goes to the sealing room for this purpose, being filled into the various receptacles through filling machines of interesting mechanism, sealed, packed, and sent to the warehouse for final shipment.

If evaporated cream is to be made, from the

sealing room it goes to the sterilizing room where the necessary sterilizing of the sealed package is performed and from this point goes to the storage room.

A condensed milk plant properly operated buys its supplies in large quantities; tin plate for making its cans (each factory containing a complete can-making tin-shop); lumber in shooks for making boxes; so that nearly all the work incidental to completing the product is done in the factory. Such a plant represents a large investment.

Errors of Previous Authorities and Reports.—Some of the earlier descriptions of the manufacture of condensed milk have erroneously stated that it was the general practice to remove a part or all of the cream before manufacture. This has never been practised except by an occasional concern desirous of evading the law, to increase its profit. The dairy laws of the several States where most of the milk is manufactured are very rigidly enforced to prevent removing any part of the cream from the natural fluid milk.

Chemical Analysis.—As condensed milk forms such a very large and important item of food, especially for the infant, it is proper in this article to incorporate information on the question of analysis that the public may be correctly informed on the subject. To determine the butter-fats in plain condensed milk or evaporated cream is comparatively easy, but with the preserved milk where cane-sugar is present it is a difficult piece of work except when performed by a chemist of considerable experience who has made a special study of the matter, for the fat cannot be correctly estimated unless precautions are taken to eliminate the influence of the cane-sugar during the extraction of the fat.

It has become a common error on the part of boards of health whose chemists are not always thoroughly experienced in the business to erroneously designate a brand of milk as skimmed or partly skimmed when the error is solely in the work of the analyst. Prof. J. F. Geisler of New York, who has probably had as wide experience in this especial work as any chemist living, in a paper read at the 21st general meeting of the American Chemical Society, June 1900, pointed out some of the difficulties in the way of proper analysis of condensed milk preserved with sugar. He states as follows:

"There is an abundant and cumulative evidence to show that the correct analysis of sweetened condensed milk is difficult and has proved to be a stumbling block to the efforts of many chemists.

"A law of New York State requires that no condensed milk shall be made—unless the proportion of milk solids shall be in quantity the equivalent of 12 per centum of milk solids in crude milk and of which solids 25 per centum shall be fats." Sec. 25, Chap. 143, L. 1894.

"Aside from insufficient condensation, it is generally assumed that skimming or the removal of butter-fat is the principal temptation to defraud on the part of the manufacturer. To prove skimming, the first essential is the accurate estimation of the fat, assuming the per cent of fat obtained to be butter-fat. That is to say, the mere finding of the required per

CONDENSER

cent of fat, and ratio of fat to milk solids would not prove such milk unadulterated unless the fat found was actually butter-fat.

"The recurring frequency of unjust condemnation of condensed milk makes it particularly necessary for chemists to exercise great caution in expressing opinions upon whether a milk is skimmed or not. There are instances on record where sweetened condensed milks with high content of cane-sugar and of unquestioned purity were condemned as adulterated on the strength of the analysts finding low percentages of fat (3.8 per cent lowest and a considerable number ranging from 5.5 to 6.8 per cent) when more accurate methods demonstrated the presence of over 8 per cent of fat in all the samples.

"The effective manner in which the cane-sugar prevents the action of the solvents upon the fat is well illustrated in the asbestos-tube method for fat estimation, in which 20 cc. of a 20 per cent solution of the milk (4 grams) is deposited upon asbestos fibre, and, after drying, exhausted with petroleum ether. This method has been the means of the unjust and unwarranted condemnation of quite a number of condensed milks. It has been proved that the method failed to exhaust all the fat, often 2 to 3 per cent remaining in the residue, as has been amply demonstrated by exhausting the residue with water and recovering the shortage of fat in the residuum. The asbestos method has found favor in many quarters and was the direct cause of condemnation of pure milks in several instances.

"Even the coil method, which is extensively used by analysts, unless certain precautions are taken, has its pitfalls. The quantity of milk taken for the extraction is not a matter of indifference, nor is the solvent, or the method of extraction.

"As ordinarily applied, the following shows the errors of the coil method: Forty-nine separate examinations showed differences for the second exhaustion of 0.27 to 1.2 per cent. That is to say, if the precaution of exhausting the coils with water had not been taken, the fat in the milks would have been underestimated from 0.27 to 1.2 per cent in actual per cent of fat by the coil method. The large variation is due principally to the varying per cent of cane-sugar in the different samples.

"Accuracy in fat estimation to within 0.2 per cent in sweetened condensed milk is certainly attainable where the necessary precautions are taken. Where 2 grams of the condensed milk are taken the results cannot be depended upon, however, as representing the full yield of fat, unless the exhausted and dried coil is exhausted with water, and again exhausted with volatile solvent.

"A difference of 0.5 per cent fat has a very important bearing in the enforcement of a law defining the fat contents in milk solids. This is particularly true when the Ritthausen method is used for the estimation of the albuminoids, any error in the fat estimation reflecting its deficiency in increase of the albuminoids (the albuminoids being determined by difference) so that the ratio between fat and albuminoid is distorted to a degree which would reflect seriously upon the milk under examination, and indicate probable skimming.

"This no doubt accounts for the discrepancy in quite a number of published analyses of the excess of albuminoid over fat in what probably were unskimmed milks. When such discrepancies are noticed in an analysis it is advisable to check the results by a nitrogen estimation by the Kjeldahl method, if this was not used in the first instance."

Food Value.—An analysis of condensed milk (preserved) of high average quality would be about as follows:

Fat			9.82	
Milk sugar	}	Carbohydrates	{	12.49
Cane sugar				40.50
Albumin	}	Albuminoids proteids	{	8.80
Casein				
Ash			1.90	
Water			26.49	
			100.00	

Evaporated cream of the same high quality would contain the following constituent parts:

Fat			9.52	
Milk sugar and albuminoids.....			20.93	
Ash			1.90	
Water			67.65	
			100.00	

Of all the foods available to the public, it is doubtful if any rank as high in purity, keeping quality and uniformity, for infant feeding, household uses, for supplying the army and navy, shipping trade, exploring parties or pioneer life; no food article prepared has greater value.

The world in the broadest sense has been blessed by the development of Gail Borden's invention.

WILLIAM J. ROGERS,
President Borden's Condensed Milk Co.

Condenser, one who or the thing which condenses. Some of the methods in general use are:

Steam-engine.—An apparatus for reducing to a liquid form the steam in front of the piston, so as to obtain a partial vacuum at that point, and thus utilize the natural pressure of the atmosphere. Watt invented the injection condenser and the separate condenser. The surface condenser has a series of flat chambers or tubes, usually the latter, in which the steam is cooled by a body of water surrounding the tubes. Distilled water for ships' use is obtained by the condensation of steam in a surface condenser.

Distilling.—The still-condenser is an apparatus generally made of the worm-tube form; the coil containing the alcoholic vapor traversing a tub which receives a constant accession of cold water, condensing the vapor in the coil. The liquid escapes at a cock valve below.

Metal.—An apartment in which metallic or deleterious gaseous fumes are condensed to prevent their escape into, and contamination of, the atmosphere. The device consists of a prolonged duct for the fumes, with showers of water to condense the arsenical, sulphurous, and other fugitive volatile matters. It also serves an economical purpose in saving fugitive fumes of lead, zinc, mercury, sulphur, antimony, and similar metals.

Electricity.—(1) An instrument for concentrating electricity by the effect of induction. It usually consists of a confolded sheet of tin-foil, whose layers are separated by a thin sheet having a non-conducting surface. (2) With induction apparatus, a device for absorption or sup-

CONDENSING AND NON-CONDENSING ENGINES — CONDITION

pression of the extra current induced by the rapid breaks in the main current. (3) An instrument in which an electric spark passes between the poles in a closed glass cylinder, so as to be employed in burning metals in an atmosphere of any given tenuity or specific chemical character, to obtain the spectra of metals or gases free from accidental characteristics of the general atmosphere for the time being.

Condensing and Non-condensing Engines.

Steam-engines are classified according to the method in which they use steam. In the non-condensing engine, the steam, after having performed its work in the cylinder, is exhausted into the atmosphere at a pressure equal to that of the atmosphere (14.7 pounds on each square inch of surface at the level of the sea), thereby giving a back pressure equal to that amount which the steam actuating the piston has to work against, or overcome constantly. It is entirely possible, however, to so arrange a method of using the steam that, after having performed its work in the cylinder instead of being exhausted into the atmosphere at a pressure of 14.7 pounds, it shall be exhausted into a reservoir within which a vacuum is constantly maintained, and thus conserve the energy lost in overcoming the back pressure in the cylinder. The most convenient method of securing a vacuum is by condensing the steam which fills a given volume or reservoir back to the form of water, and engines operating on this principle of exhausting into a vacuum are classified as condensing engines. The physical principle on which a partial vacuum is caused by the condensation of steam is, that one cubic inch of water forms 1,700 cubic inches of steam at a pressure of one atmosphere. Therefore, if that volume of steam is condensed back to water, the reduction of volume is in the same proportion less only the volume occupied by the tenuous vapor given off even by cool water in a vacuum. To maintain a vacuum thus obtained, it is only necessary to provide suitable apparatus to draw off the water as it is being created by the condensation of the steam. The earliest steam-engines were all of the condensing type. Steam at pressures slightly above that of the atmosphere was admitted to the cylinder for the working stroke, and the absence of pressure on the working side of the piston due to the vacuum caused by the condensation of the steam was the principal dependence for the power of the stroke. They were called low-pressure engines, while those of the non-condensing type which necessarily required a higher boiler pressure to overcome the back pressure in the cylinder were designated as high-pressure engines, so that at one time the terms high-pressure and low-pressure were synonymous with the terms non-condensing and condensing, respectively. This relation, however, does not apply at the present time, since the majority of modern condensing engines are operated by steam at high-pressure. The advantages of the condensing engine may be stated as follows: The same power can be secured by a smaller cylinder of the condensing type than of the non-condensing type, with all the attendant advantages of diminished bulk, while the condensation of the steam to a temperature of about 130° F. (usual practice) affords a quantity of pre-heated water which can be used to replace the amount turned out of the boiler in the form of steam, thus saving fuel,

and extending the wear of the boiler. Its disadvantages are partly inherent, and partly accidental. The inherent disadvantages are due to four conditions: (1) The lowering of the temperature and pressure of the steam lowers the temperature of the metal of the cylinder and increases the amount of condensation to be expected within the cylinder, so that the actual economy is much less than the theoretical economy; (2) the maintaining of the vacuum imposes an amount of work upon the engine, directly or indirectly, which a non-condensing engine is not required to perform; (3) the serious annoyance caused by the introduction of lubricating material into the cylinder where it fouls and stops up the passage, thence into the condenser, and finally into the boiler, where, by forming a coating on the heating surfaces, causes overheating by preventing the intimate contact of the water with the metal; (4) the condition that it can only be used where a sufficient quantity of water for condensation can be obtained at a small expense, thus limiting the application of the principle to stationary engines on land, although for that very reason it is pre-eminently applicable to all types of marine engines. Locomotives cannot be operated as condensing engines. The accidental disadvantages depend upon the methods employed to apply the principle — (1) if the pumps attached to the condensing apparatus are driven by the engine itself, a high rotative speed is impracticable, since the engine cannot be run at a speed faster than that required for the proper working of the pumps; and (2) if the engine operates its own condensing apparatus at low speeds, the weight and bulk of such appliances become inconvenient.

Bibliography.— Hutton, 'The Mechanical Engineering of Power Plants' (1903); Hutton, 'Heat and Heat-Engines' (1900); Perry, 'The Steam Engine' (1902). W. MOREY, JR.,

Consulting Civil Engineer.

Condillac, Etienne Bonnot de Mably de, *ā-tē-ēn bōn nō de mā-blē de*, French philosopher: b. Grenoble 30 Sept. 1715; d. Beaugency 3 Aug. 1780. He founded an international reputation on 'The Essay on the Origin of Human Knowledge (or Sense Perceptions)' (1746); duly succeeded by the celebrated 'Treatise on the Sensations' (1754), the central standpoint of these and other works being what is, philosophically speaking, sensationalism; a belief, that is, that what we know we know only through the senses, and hence our ideas of deity, love, the soul, etc., are largely modified forms of the objects that impress us in our daily material experience. These standpoints were practically those of French philosophy till the advent of Cousin. Among his other works are: 'Traite des Sensations' (1755); 'Cours d'Etudes' (1755); 'Le Commerce et le Gouvernement Considérés Relativement l'un à l'autre' (1776); 'La Logique' (1781); 'Langue des Calculs' (1798).

Condition, in law a statement of terms, a provision or stipulation, as in a contract, by which the parties thereto consent to be bound; or an undertaking to do something, pay money or other consideration, etc., as a proviso in an agreement by which the other parties thereto bind themselves to perform some act in return. Conditions must be made at the same time as the original conveyance or contract, but may be by a separate instrument, which is then con-

CONDITIONAL IMMORTALITY — CONDONATION

sidered as constituting one transaction with the original. Unlawful conditions are void. Conditions in restraint of marriage generally are held void; but this is not true of conditions restraining from marriage to a particular person, or restraining a widow from a second marriage. A condition in general restraint of alienation is void, but a condition restraining alienation for a limited time is good. Where land is devised, there need be no limitation over to make the condition good, but where the subject of the devise is personalty without a limitation over, the condition, if subsequent, is held to be *in terrorem* merely, and void. But if there be a limitation over, a non-compliance with the condition divests the bequest. A limitation over must be to persons who could not take advantage of a breach. Performance should be complete and effectual. An inconsiderable casual failure to perform is not non-performance. Any one who has an interest in the estate may perform the condition, but a stranger gets no benefit by performing it. Conditions precedent, if annexed to land, are to be strictly performed, even when affecting marriage. Conditions precedent can generally be entirely performed, and usually at any rate equity will not interfere to avoid the consequences of non-performance.

The word "condition" also means the situation of every person in some one of the different orders of persons which compose the general order of society and allot to each person therein a distinct separate rank. For instance, at common law, a person under 21 is an infant, with certain disabilities and privileges. Every person is presumed to know the condition of the person with whom he deals.

Conditional Immortality, a tenet held by a theological school which denies the inherent immortality of the soul, and the consequent doctrines both of eternal misery and of Universalism as contrary to the teachings both of nature and of revelation. Its advocates maintain that the Bible sets immortality before men as something to be sought after (Rom. ii. 7), as a divine gift offered on certain conditions (Rom. vi. 23; John iii. 15, 16), and as a matter of hope and promise in the present life (Titus i. 2); that this immortality is not a present possession (Mark x. 30), and is to be realized by the assumption of a spiritual body at the resurrection of regenerate men from the dead (Luke xx. 35, 36), an event synchronous with the second coming of Christ (1 Cor. xv. 51, 52). Divine testimony, no less than experience, they say, declares unequivocally that man has the same natural life as all other animals (Eccles. iii. 19), and only those who by faith and obedience are united to Christ have the promise of immortality. The Calvinistic doctrine of eternal misery is untenable, the punishment of sin being death or everlasting destruction, to be inflicted subsequent to a judgment after the Lord returns (2 Thess. i. 9, 10). The dogma of Universalism, the only alternative to endless torment if the soul must live forever, is also, they maintain, unfounded, since the punishment of sin (death) is said to be everlasting, like the life which is the reward of the righteous (Matt. xxv. 46). The Conditional Immortality Mission began in Great Britain in 1878. It has an organ 'The Bible Standard,' published

monthly by the secretary. Churches have been established in the United States.

Conditioned, Philosophy of the, or Philosophy of the Unconditioned, the name given by Sir William Hamilton to certain philosophical views first promulgated by him in an article contributed to the 'Edinburgh Review,' in October 1829, forming a critique on Victor Cousin's philosophy, especially of his doctrine of an absolute cause. The Unconditioned is regarded by Sir William Hamilton as a genus including two species: the Infinite, or the unconditionally unlimited, and the Absolute, or the unconditionally limited; and the thesis which he maintains and expounds in the essay referred to, and which forms one of the leading doctrines of his philosophical system, is that the Unconditioned, as thus explained, is entirely unthinkable. In his own words, "the mind can conceive, and consequently can know only the limited, and the conditionally limited. . . . Conditional limitation is the fundamental law of the possibility of thought." This he illustrates by stating that we can neither conceive an absolute whole, that is, a whole so great that we cannot conceive it also as a part of a still greater whole; nor an absolute part, that is, a part so small that we cannot conceive it as a relative whole, divisible into still smaller parts. And this he declares to hold good as to space, time, and degree. "The Conditioned," he goes on to say, "is the mean between two extremes—two unconditionates, exclusive of each other, neither of which can be conceived as possible, but of which, on the principles of contradiction and excluded middle, one must be admitted as necessary." The Unconditioned, on the other hand, being merely negations of the Conditioned in its opposite extremes, bound together by the aid of language and their common character of incomprehensibility, is not even a notion, either simple or positive. It presents no object to the thought, and can afford no real knowledge. From this, however, we are only to learn that our faculties are weak, and that hence we have no right to constitute our capacity of thought into the measure of existence. Although then we are unable to conceive anything above the relative and finite, it is quite competent to us to believe in the existence of something unconditioned beyond the sphere of all that is conceivable by us. This doctrine was adopted by Mansel, dean of St. Paul's, and applied by him to determine the limits of religious thought. It was combated by John Stuart Mill. Consult: Mansel, 'Limits of Religious Thought'; Mill, 'Examination'; Sir William Hamilton, 'Discussions.'

Condom, kôn-dôn, France, a town in the department of Gers, on the Baise River, which is here crossed by two stone bridges, 25 miles northwest of Auch. It contains an ancient church, a Gothic edifice, and in the outskirts are a number of handsome villas. The manufactures are porcelain, woolen yarn, leather, and brandy. It was formerly the capital of Pays-de-Commois. Bossuet was appointed Bishop of Condom in 1669, but remained here only one year. Pop. 4,500.

Condonation, in law, a forgiveness of injury, such as to restore the person who has committed an offense to the same position which he or she held before it was committed. In

CONDOR

an action on the ground of adultery it is a legal plea in defense.

Condor, the popular name of the great vulture of the Andes, formed by a mispronunciation of the Indian name *kunter*, which, according to Humboldt, is derived from another word in the language of the Incas, signifying "to smell well." This species (*Vultur gryphus*, Linn., or *Sarcoramphus gryphus*) belongs to the family (*Cathartidæ*) of diurnal rapacious birds, and which is distinguished by the following characters: The bill is elongated and straight at base; the upper mandible is covered to the middle by the cere; the nostrils are medial, approximate, oval, pervious, and naked; the tongue is canaliculate, with serrated edges; the head is elongated, depressed, and rugous; the tarsus rather slender; the lateral toes equal; the middle toe is much the longest, the inner free, and the hind one shortest; the first primary is rather short, the third and fourth are longest.

The natural history of the condor was in a fair way to rival the ancient fables of griffins, basilisks, and dragons, or even of exceeding the roc of Sinbad the Sailor, in extravagant exaggeration, until Humboldt placed it upon the basis of truth. His careful measurements established the fact that the wonderfully gigantic condor is not generally larger than the lammergeyer, or bearded vulture, of the Alps, which it closely resembles in various points of character. These birds prefer to dwell above all animal life, and at the extreme limit of even Alpine vegetation, inhaling an air too highly rarefied to be endured, unless by creatures expressly adapted thereto. From such immense elevations they soar upward until their great bulk diminishes to a scarcely perceptible speck, or is lost to sight. The condor is a carrion bird, and is quickly lured to the plains by the sight or scent of a carcass. To such a feast considerable numbers repair, and commence their banquet by first plucking out the eyes, and then tearing away the tongue of the animal; next to these the bowels are eagerly sought for, and devoured with that gluttony which distinguishes the whole vulture tribe. The appetite of these birds seems to be limited only by the quantity of food that can be gorged into their stomachs; and when thus overloaded they appear sluggish, oppressed, and unable to raise themselves into the air. The Indians profit by this condition to revenge themselves for the robberies which they commit upon their flocks, and, watching while they eat until flight has become exceedingly difficult, attack and secure them by nooses, or knock them down with poles before they can get out of the way. If the condor, thus loaded, succeeds in rising a short distance from the ground, he makes a violent effort, kicking his feet toward his throat, and relieves himself by vomiting, when he soon ascends out of reach. Many, however, are surprised, and are captured or killed before they are able to ascend. But the condor does not exclusively feed upon dead or putrefying flesh; he attacks and destroys deer, vicuñas, and other middling-sized or small quadrupeds; and when pinched by hunger a pair of these birds will attack a bullock, and by repeated wounds with their beaks and claws harass him until, from fatigue, he thrusts out his tongue, which they immediately seize and tear from his head; they also pluck out the eyes of the poor beast, which, if not speedily rescued, soon falls

a prey to their voracity. It is said to be very common to see the cattle of the Indians on the Andes suffering from the severe wounds inflicted by these rapacious birds. It does not appear that they have ever attacked man. When Humboldt, accompanied by Bonpland, was collecting plants near the limits of perpetual snow, they were daily in company with several condors, which would suffer themselves to be quite closely approached without exhibiting signs of alarm, and never showed any disposition to act offensively. The nesting-time of the condor varies with the latitude, and the place selected for the nest is usually some inaccessible ledge of rock. It lays two white eggs from three and a half to four inches long, which are hatched in about seven weeks. The development of the young birds is very slow, since they are not able to fly until they are a year old, and they have to remain with the parent birds for a year or two longer. They are occasionally seen even on the shores of the southern ocean, in the cold and temperate regions of Chile, where the Andes so closely approach the shores of the Pacific. Their sojourn, however, in such situations is but for a short time, as they seem to require a much cooler and more highly rarefied air, and prefer lofty solitudes from 10,000 to 15,000 feet above the level of the sea. When they descend to the plains they alight on the ground rather than upon trees or other projections, as the straightness of their toes renders the first-mentioned situation most eligible. Humboldt saw the condor only in New Granada, Quito, and Peru, but was informed that it follows the chain of the Andes from the equator to the seventh degree of north latitude into the province of Antioquia. There is now no doubt that it ranges from nine or ten degrees north of the equator to the Straits of Magellan. The king vulture (*S. papa*) is another bird of the same genus.

The head of the male condor is furnished with a sort of cartilaginous crest, of an oblong figure, wrinkled, and quite slender, resting upon the forehead and hinder part of the beak for about a fourth of its length; at the base of the bill it is free. The female is destitute of this crest. The skin of the head in the male forms folds behind the eye, which descend toward the neck, and terminate in a flabby, dilatible, or erectile membrane. The structure of the crest is altogether peculiar, bearing very little resemblance to the cock's comb or the wattles of a turkey. The auricular orifice is of considerable size, but concealed by folds of the temporal membrane. The eye, which is peculiarly elongated, and farther distant from the beak than the eagle's, is of a purple hue and very brilliant. The neck is uniformly marked by parallel longitudinal wrinkles, though the membrane is not so flabby as that covering the throat, which appear to be caused by the frequent habit of drawing the neck downward to conceal or warm it within the collar or hood. The collar in both sexes is a fine silken down, forming a white band between the naked part of the neck and beginning of the true feathers, and is rather more than two inches broad, not entirely surrounding the neck, but leaving a very narrow naked space in front. The rest of the surface, the back, wings, and tail, are of a slightly grayish-black, though sometimes they are brilliantly black; the feathers are triangular, and placed over each other tile-wise. Humboldt

CONDORCANQUI — CONDOTTIERI

never saw male condors with white backs, though descriptions of such have been given by Molina and others. The primaries are black; the secondaries in both sexes are exteriorly edged with white. The wing-coverts, however, offer the best distinction of the sexes, being grayish-black in the female, while in the male their tips, and even half of the shafts, are white, so that his wings are ornamented with beautiful white spots. The tail is blackish, wedge-shaped, rather short, and contains 12 feathers. The feet are very robust, and of an ashen blue color marked with white wrinkles. The claws are blackish, very long, and but slightly hooked. The four toes are united by an obvious but delicate membrane; the fourth is the smallest, and has the most crooked claw. The largest male condor described by Humboldt was three feet three inches long from the tip of the beak to the tip of the tail; height, when perched, with the neck moderately extended, two feet eight inches; from the tip of one extended wing to the tip of the other, eight feet nine inches. Humboldt states that he never saw a condor which measured more than nine feet across the wings; but a specimen described by Dr. Shaw measured 14 feet. Notwithstanding, therefore, what is said by Humboldt of the general correspondence in size of the Alpine lammmergeyer and the condor of the Andes, we cannot avoid believing that a full-grown individual of the latter species would be much more than a match in every respect for any European species. The condor is peculiarly tenacious of life, and has been observed, after having been hung for a considerable time by the neck in a noose, to rise and walk away quickly when taken down for dead, and to receive several pistol bullets in its body without appearing greatly injured. Its plumage defends its body to a considerable degree from the effects of shot. It is easily killed when shot, or struck sufficiently hard, about the head.

A very similar species is the California condor or vulture, which may be easily distinguished from the true condor, which it nearly equals in size, by the lack of the white neck-ruff and of the caruncle of the male. The California vulture formerly ranged northward on the Pacific coast into British Columbia, but its habitat is said to be shrinking and now reaches only to Monterey on the north. The species may be approaching extinction. Like the condor, in addition to feeding on carrion, it attacks and kills young or sick animals, particularly lambs and calves. The rough nest of sticks, in which two dirty-white eggs are laid, is built on the ground, rock ledges, or stumps.

Condorcanqui, José Gabriel, hō-sā gā'-brē-ěl kōn-dōr-kān-kē' ("TUPAC AMARU"), Peruvian revolutionist: b. Tinta 1742; d. Cuzco, 18 May 1781. He is called "The Last of the Incas," and in 1771 took the name of Tupac Amaru. In 1780 he incited the Peruvian Indians to rebellion against Spain, professing a design of restoring the dynasty of Manco Capac. This rebellion was the most important in South American colonial history. For three years the contest raged with doubtful success; at length, however, the natives fell away from him, and he was taken and executed. The cruelty of the Spaniards in this insurrection ultimately led to the independence of Peru.

Condorcet, Marie Jean Antoine Nicolas de Caritat, mā-rē zhōn ān-twān nīk-ō-lā de kā-rē-tā kōn-dōr-sā, MARQUIS DE, French philosopher and mathematician: b. Ribemont, Picardy, 17 Sept. 1743; d. Clamat 28 March 1794. At the age of 21 he presented to the Academy of Sciences an 'Essai sur le Calcul Intégral.' His 'Memoire sur le Problème des Trois Points' appeared in 1767. Both works were afterward united under the title of 'Essais d'Analyse.' The merit of this work gained for him in 1769 the distinction of a seat in the Academy of Science. With astonishing facility and versatility Condorcet treated the most difficult problems in mathematics; but his genius inclined him rather to lay down beautiful formulas than to pursue them to useful applications. In 1777 his 'Theory of Comets' gained the prize offered by the Academy of Berlin. The aversion of the minister Maurepas to Condorcet delayed his entrance into the French Academy till 1782. During the troubles of the French Revolution his sympathies were strongly engaged on the side of the people. On the intelligence of the flight of King Louis XVI. he represented in a speech which was highly admired, the royal dignity as an anti-social institution. In the national convention, in which the legislative assembly was merged 20 Sept. 1792, he voted for the most part with the Girondists. On the trial of Louis he was in favor of the severest sentence not capital; at the same time he proposed to abolish capital punishments, except in case of crimes against the state. The fall of the Girondist party 31 May 1793 prevented the constitution which Condorcet had drawn up from being accepted. The constitution then adopted he attacked and was accused 3 October of being an accomplice of Brissot. To save his life he concealed himself, and was declared out of the protection of the law. While in hiding Condorcet wrote his curious 'Esquisse d'un Tableau historique des Progrès de l'Esprit humain,' full of enthusiasm for liberty. At Clamat he was arrested as a suspicious person by a member of the revolutionary tribunal of Clamat, and thrown into prison to undergo a more strict examination. On the following morning he was found dead on the floor of his room, apparently having swallowed poison. A collection of his numerous writings, complete with the exception of his mathematical works, appeared in Paris in 1804. Consult Arago, 'Biographie de Condorcet' (1849).

Condottieri, kōn-dōt-tē-ā'rē, a class of mercenary adventurers in the 14th and 15th centuries, who commanded military bands, amounting to armies, on their own account, and sold their services for temporary engagements to princes and states. The bands under command of the Condottieri were well armed and equipped. Their leaders had in many instances considerable military skill; but, as they took no interest in national contests, except to receive pecuniary advantages, the wars between them became a sort of bloodless contest, in which the only object of each party was to take as many prisoners as possible for the sake of the ransom. This singular system of warfare was put to an end by the more serious military operations of the French, who invaded Italy under Charles VIII. Though many Condottieri acquired much honor as well as emolument, one only attained to high rank and independent

CONDUCTION OF HEAT — CONEPATE

power; this was Francesco Sforza, originally a peasant, who in 1451 made himself Duke of Milan, and transmitted that sovereignty to his descendants.

Conduction of Heat. See HEAT.

Conduit, kōn'dīt, in architecture, a long narrow passage between two walls or underground, for secret communication between various apartments, of which many are to be found in old buildings; also a canal of pipes for the conveyance of water, a sort of subterraneous or concealed aqueduct. The construction of conduits requires science and care. The ancient Romans excelled in them, and formed the lower parts, whereon the water ran, with cement of such an excellent quality that it has become as hard as the stone itself which it was employed to join. There are conduits of Roman aqueducts still remaining, of from five to six feet in height, and three feet in width. Conduits in modern times are generally pipes of wood, lead, iron, or pottery, for conveying the water from the main spring or reservoirs to the different houses and places where it is required.

Condurango, kōn-dū-rāng'gō, or **Cundurango**, the bark of the *Marsdenia Condurango*, a medium-sized twining plant of Ecuador and adjacent states. It is somewhat bitter; at one time it was much vaunted as a specific in the treatment of cancer.

Condylarthra, kōn-dī-lār'thrā, a primitive order of ungulates of the early part of the Tertiary Period, collateral ancestors of the later hoofed animals, and connecting them with the primitive clawed animals, especially with the *Creodonta*. They were mostly of small size, five-toed, omnivorous, with bunodont teeth like those of the pigs, long tail, small brain and other primitive features. *Phenacodus*, of the Lower Eocene, of the size of a wolf, is the largest and best known. Remains of *Condylarthra* are found chiefly in North America, but also in Europe and in South America. They became extinct in the Middle Eocene.

Condyle, kōn'dīl, in anatomy, a protuberance on the end of a bone serving to form an articulation with another bone, and more especially applied to the prominence of the occipital bone for articulation with the spine.

Cone, Helen Gray, American poet: b. New York City 8 March 1859. Since 1899 she has been professor of English in the New York City Normal College. She is the author of 'Oberon and Puck: verses Grave and Gay' (1885); 'Baby Sweethearts' (1890); 'The Ride to the Lady and Other Poems' (1891).

Cone, Orello, American educator and author: b. 16 Nov. 1835; d. 23 June 1905. He was professor of biblical languages and literature in St. Lawrence University, N.Y., 1865-80; president of Buchtel College, Ohio, 1880-96; and Richardson professor of biblical theology in St. Lawrence University, 1900-5. He published: 'Gospel-Criticism and Historical Christianity' (1891); 'The Gospel and Its Earliest Interpretations' (1893); 'Paul, the Man, the Missionary, and the Teacher' (1898); edited 'Epistles to the Hebrews, Colossians, Ephesians, Philemon, etc.' (1901); 'Rich and Poor in the New Testament' (1902).

Cone, Spencer Houghton, American clergyman: b. Princeton, N. J., 30 April 1785; d.

28 Aug. 1855. After a varied career as school teacher, actor, journalist, and government clerk, he was converted November 1813, and baptized into the fellowship of the Baptist Church, and soon began to preach with great success. He was chaplain of the House of Representatives, 1815-16; pastor at Alexandria, Va., for 7 years; of the Oliver Street Church, New York, for 18 years, and of the First Baptist Church in the same place until his death. He was president of the American and Foreign Bible Society, 1837-50, and of the American Bible Union from its formation until he died. For many years he was one of the most popular and influential clergymen of his denomination in the United States. There is a 'Memoir' of him by his son, Spencer Wallace Cone (1819-88).

Cone. 1. In geometry, the solid figure traced out when a right-angled triangle is made to revolve round one of the sides that contain the right angle; this is more strictly a right circular cone. A more comprehensive definition may be given as follows: Let a straight line be held fixed at one point, and let any other point of the line be made to describe any closed curve which does not cut itself; the solid figure traced out is a cone. The moving line is known as a generating line or generator of the cone. When the axis of the cone, that is, the line joining the fixed point to the centre of the closed curve, is perpendicular to the plane of the base, the cone is right; and when in addition the curve which the second point describes is a circle, the cone is a right circular cone. Cones whose axes are inclined to their bases at any angle other than a right angle are known as oblique cones. If a cone be cut in two by a plane parallel to the base, the lower portion is called a frustum or a truncated cone. The geometry of the cone is important on account of the curves called conic sections, which are obtained by cutting a right circular cone by planes in various directions. The cubic content of a right circular cone is one third of that of a cylinder on the same base and of the same altitude. The cubical content of the cone is therefore found by multiplying the area of the base by the altitude, and taking one third of the product. The area of the slant or curved surface is obviously equal to that of a sector of a circle of radius equal to the slant height, and arc equal to the circumference of the base. It is therefore obtained by multiplying the slant height by the circumference of the base, and taking one half of the product.

2. In botany, a dry compound fruit, consisting of many open scales, each with two seeds at the base, as in the conifers; a strobilus.

Cone-Nose. A true bug (*Conorhinus sanguisuga*) of the family Reduviidæ, related to the bedbugs and having similar habits in the South; it is nearly an inch long, and black, blotched with red. In 1898 much excitement was occasioned in the North by newspaper accounts of attacks by "kissing-bugs," which were two related species, *Reduvius personatus* and *Melanolestes picipes*, the former frequently found in dirty houses feeding upon cockroaches, bedbugs, etc., and breeding in dusty corners. The bite is painful, but not poisonous.

Conepate, kō'ně-pāt, the name given in Mexico to the large white-backed skunk of that region. See SKUNK.

CONE-SHELLS — CONFARREATIO

Cone-shells, or **Conidæ**, a family of ctenobranchiate *Gastropoda*, so called on account of their form. All the cones have a similar external outline; the aperture is long and narrow, the head of the living animal is more or less lengthened, the proboscis elongated, the foot is splay and abruptly cut off in front, the tentacles are rather widely separate and the eyes are placed on these organs. All of the species are carnivorous, and the bite of some of those found in the South Seas is reputed poisonous. Several hundred species have been described, about one fifth of them from tropical American waters. Owing to their beauty and variety the cones are much sought by collectors, who pay extravagant prices for the rarer forms. The textile cone-shells (*Conus textilis*), brought from Mauritius, a handsome species four or five inches in length, are marked with narrow, angular lines of dark brown, variegated with dashes of yellow and irregular white spots. It haunts the fissures and holes in rocks and the warmer pools in coral reefs. They all take a moderate range of depth, varying from 1 to 40 fathoms.

Cones, Pyromet'ric, or **Segeer Cones**, instruments for measuring heat, consisting of three-sided pyramids about two and a half inches high and one half inch base. They are composed of fusible substances, and are graded so that they melt, each at its own temperature. The cones were invented by Dr. Herman Seger, of Berlin, for use in pottery kilns, and have since been largely adopted. An earlier method of heat measurement was the fusible alloys invented by Prinsep. Alloys of silver, gold, and platinum were so calibrated that they would, as to melting-point, cover the whole range between the two extremes of fusion of the metals. Many objections to these were found in practice, notably the expense and liability to loss. The Seger cones perform the same service and are very inexpensive. The cones range in numbers from 1 to 36 and back from .—1 to .—22. In practice two or three cones, approximating the required temperature, are set upright in the kiln upon a morsel of soft clay. The softer of them will, as the temperature reaches the proper point, bend over and melt, to be followed in regular order by the successive higher numbers. They can be easily seen through the hole left in the kiln wall for the inspection of trials.

Cones'si-bark, the bark of *Holarrhena antidysenterica*, a plant of India, used as a tonic, a febrifuge, and an astringent in diarrhoea. The plant is a shrub with opposite leaves and terminal cymes of flowers.

Conestoga, kōn-ēs-tō'gā, or **Conestogas**, a tribe of Indians belonging to the Iroquois linguistic stock, and formerly living on the lower course of the Susquehanna and at the head of Chesapeake Bay. At the time of the settlement of Virginia (1607) the Conestoga were at war with the Mohawks, whom they had almost exterminated. Later they became a source of serious trouble to the white settlers. With the Dutch and Swedes they were more friendly than with the English. By 1675 the tribe was holding land on the eastern bank of the Potomac River in Maryland. Giving way before the Iroquois they retreated southward, committing depredations upon the white settlements. Some of the refugees of the tribe escaped to North Caro-

lina; others after submission to the Iroquois returned to the Susquehanna. In 1701 the Conestoga made a treaty with William Penn.

Coney, the name formerly given in England to the rabbit. In the western United States, the name is applied to a distant relative, the pika (q.v.), although this creature has little resemblance to the rabbit. The term as found in Scripture is a translation of the Hebrew *shaphen*, the local name for the Syrian species of hyrax, or daman. See HYRAX.

Coney Island, New York city, a small island in the borough of Brooklyn, about 10 miles southeast of the borough of Manhattan. It is about five miles in length and from half to three quarters of a mile in width; separated from the mainland by Coney Island creek. It is connected with the borough of Manhattan and Brooklyn by steam and electric railroads and steamboat lines. It is a noted day summer resort, and has numerous bathing houses, hotels, concert and other amusement halls, carousels, pavilions, electric lights, and a fine cycle path connecting it with Prospect Park, Brooklyn. Coney Island is divided into four sections: Sea Gate, the home station of the Atlantic Yacht Club; West Brighton; Brighton Beach, and Manhattan. There is a lighthouse at Sea Gate and many summer cottages, besides the Atlantic Yacht Club House. Sea Beach is the site of several charitable sanitariums, and is a popular pleasure resort. Brighton and Manhattan have extensive hotels, and are the preferred resorts for the wealthier class. Coney Island was one of the first landing places of the Dutch, and for over 200 years was considered a worthless waste. In 1840 steamboats began making excursions there, and for 25 years it was a popular resort. In 1875 steam railroads were built and since then the island has been the most popular resort in the immediate neighborhood of New York. In 1899 a scheme was proposed by the city authorities to purchase and reclaim a large portion of Coney Island and convert it into a public park. In 1903 the city opened a small public park on the island.

Confarreatio, kōn-fār-ē-ā'tē-ō, the most solemn of the three ceremonies of marriage used among the ancient Romans. The other forms of marriage were *coemptio* and *usus*. These last are the only ones mentioned by Cicero, which shows that confarreation had fallen into disuse before his time. The ceremony was performed by the *pontifex maximus*, or *flamen dialis*. A formula was pronounced in the presence of 10 witnesses, and the man and woman partook of a cake of salted wheaten bread; part of which only they ate, the rest being thrown upon the sacrifice, which was a sheep. The cake was called *far*, or *panis farreus*, hence the term "confarreatio." By this form the woman was said to come into the possession of her husband by the sacred laws, and became a partner of all his substance and sacred rites, those of the penates as well as the lares. If the husband died intestate and without children, the wife inherited the whole property like a daughter; if there were children, she received with them an equal share. The offspring of this form of marriage were called *patrimi* or *matrimi*; and from them were chosen priests and priestesses, especially the *flamen dialis* and vestal virgins. In the reign of Tiberius, he wished for a priest of this pure

CONFECTIONERY — CONFECTIONERY TRADE IN AMERICA

lineage, but the ceremony had fallen into disuse, so that three patricians thus qualified could not be found. *Confarreatio* could only be dissolved by a form of divorce equally solemn, called *disfarreatio*. The custom of bride cake is a relic of *confarreatio*; until within 200 years it was made of wheat or barley, without fruit.

Confec'tionery, (Lat. "to put together," "compound," "prepare"), a general term for any preparation with sugar as a base, used as a sweetmeat and containing nuts, fruits, or other flavoring. In the United States confectionery is commonly called "candy," a name which suggests etymologically conserved fruits or seeds; in England "boiled sweets" is the usual term, derived from the commonest method of preparation. Historically the earliest use of confectionery was to disguise the taste of unpleasant medicines, a method dating back to the primitive smearing with honey the rim of a cup holding a bitter draught, a practice common with Greek and Roman doctors. The medicinal use was long the commonest, fruit conserves being the first exception. In Italy, even in the Middle Ages, *confetti* were used in the mock battles of the carnival maskers. The true development of the manufacture of confectionery begins in the 19th century, and in England, where the trade spread after the great exhibition of English dealers at the Exposition of 1851, to Germany and France. The latter country took the lead in the manufacture of elaborate bonbons and confitures and was especially superior in its chocolate candies. But the greatest growth of the business and especially the greatest increase in the variety of confections has been in the United States. In the manufacture of cheap confections poisonous mineral dyes are used, especially for the more brilliant colors; and other dangerous adulterants, such as kaolin and terra alba, are employed.

Confectionery Trade in America. Although there is good reason to believe that the youths and maidens of the American colonies were not entirely unacquainted with the taste for sweets, and that the formulas for the making of confections which had been brought from the Old World were often tested, on the cold winter nights in the great colonial kitchens, concerning the early history of confectionery-making as a trade little is known, and as the term "confection" has always been used to include a great number of edibles that have had sugar as a base of principal ingredient it is difficult to estimate at just what point the "pastry" ends and the "candy" begins, especially in view of the fact that all so-called records prior to the 19th century are conspicuously obscure in their phraseology.

Of course, we know that, in the early days, the art of manufacturing confectionery was confined almost exclusively to the apothecaries and physicians, both of whom made use of these sweets in their attempts to disguise the unpleasant characteristics of their medicines. This secret was known to the medical fraternity as far back as the days of ancient Greece and Rome, when the physicians made a practice of smearing the outer rim of the cup with honey whenever they were compelled to give a particularly bitter draught to a patient. During the 19th century, however, the confectionery trade has experienced its greatest development, for it

is since the dawn of that century that it has become what it is to-day, one of the world's great business enterprises. In the making of this transition the druggist has not ceased to be a factor in the trade. He still requires his medicated candies, but, in this respect, he has become a purchaser, and the manufacturing confectioner who supplied his wants runs, in addition to this old-time branch of the industry, several entirely distinct branches of the trade.

It is doubtful if there is any modern industry that has experienced more radical changes during the past hundred years than the trade of confectionery-making. Prior to the year 1851, the manufacture of "boiled sweets," as candy was then called, was so largely an English specialty that the manufacturers of Great Britain might be said to have had almost entire control of the industry. In fact, it was not until the time of the great international exposition at London that the confectioners of other countries began to realize just how much their British brethren had achieved, but their unique display of candies and sweetmeats gave such an impetus to the trade that the effect was felt in every part of the civilized world. Germany imitated all its choicest products; France excelled, especially in the making of chocolate bonbons, and the candy-makers of the United States returned from the "big show" with ideas that soon made the importation of English sweets unnecessary.

In spite of the fact that England had long been the great candy-making country of the world, however, there had been confectioners in the United States long before the opening of the London exposition, and there are ample records in proof of the fact that they, too, had produced original creations that other nations were glad to copy. As early as 1816 there were no less than 20 confectioners in the city of Philadelphia, all of whom were engaged in the manufacture and sale of candies. Among these pioneers in the confectionery business one may record the names of Sebastian Henrion, who was succeeded by the firm of Henrion & Chauveau, in 1844, and Sebastian Cheuveau, who was the first candy-maker to manufacture gum-drops, jujube paste, and marshmallows in this country. Another prominent manufacturer of the old time was Paul Lajas, who, in 1831, changed his business from that of candy-making to this of sugar-refining, while the list of Philadelphia confectionery-makers includes the names of George Miller, William N. Herring, S. S. Rennels, and J. J. Richardson. Among the many old-time confectioners in the city of New York were Ridley & Company, a firm that was established as early as 1806; R. L. Stuart, James Thompson, John Stryker, and Delmonico Brothers. In Boston as early as 1816, Arnold Copenhagen, Lawrence Nichols, and William Fenno were prominently identified with the candy industry, while Joseph Bouvey, Augustus M. Price, and John L. Bridges were among the leading manufacturers and dealers in confectionery in Baltimore. Throughout the United States there were some other cities that could boast of candy-makers, but the records of those days are so meagre that but few of the names can be recalled.

In the beginning, of course, the art of candy manufacture was in a very crude state. Prior to 1845, it was almost invariably the rule that the manufacturers themselves sold at retail

CONFECTIONERY TRADE IN AMERICA

practically all the candy that they manufactured. As a rule this stock in trade usually was confined to such ordinary products as the old-fashioned stick candy, sugar plums, and the ordinary molasses candy. Finer goods, or candies in fancy shapes, were almost exclusively imported, and, as the result, were sold at a much higher price than the crude candies of home manufacture. It was about 1825, that the foreign manufacturers began to use a little machinery in their factories, but the actual introduction of machinery in the making of confectionery dates from about 1840. The first machine of this character to be brought to the United States was imported by Sebastian Chauveau of Philadelphia, in 1845. This was a revolving steam-pan. In 1846 Oliver R. Chase, who, with his brother, formed the firm of Chase & Company, invented a machine for the making of lozenges. For some years this firm had been engaged in making this once popular confection as a specialty, and it was to meet the constantly increasing demand for their product that this new invention was conceived and constructed to their model. In 1866, a further innovation in the lozenges manufacture was produced by Daniel G. Chase. This was a machine for printing on candies, and it was to this invention that the well-remembered conversation lozenges owed its existence.

Since that day the history of the confectionery trade has been a constant record of development. Year by year new improvements have been made, and new and more perfect machinery has been invented, all of which have quickly been adapted to the manufacture of the various kinds of goods that the constantly widening demands of the business have required. As a result, while the actual manufacture of candy has extended until it has become one of the nation's great industries, it has created around it a number of dependent industries, each of which now represents a special business of no slight importance. Thus, for example, the making of confectioner's machinery is now a separate industry in which a great amount of capital is invested, and the business of confectioner's supplies represents an annual product that is by no means to be despised. In fact to obtain any sort of an idea of the tremendous growth of the confectionery industry it is necessary to turn to the official census returns for the past half century. As reported by the last census the figures from 1850 to 1900 show the following comparisons:

THE CONFECTIONERY INDUSTRY 1850 TO 1900.

YEAR	No. of Establishments	Hands Employed	Capital Invested	Total Wages Paid	Value Material Used	Value of Product
1850..	383	1,733	\$1,035,551	\$458,904	\$1,691,824	\$3,040,671
1860..	541	2,340	1,568,478	668,423	2,991,186	5,361,100
1870..	941	5,825	4,905,293	2,091,826	8,703,560	15,922,643
1880..	1,450	9,801	8,486,874	3,242,852	17,125,775	25,637,033
1890..	2,921	21,724	23,326,799	7,783,007	31,116,629	55,997,101
1900..	4,297	33,583	31,155,361	10,867,687	45,534,153	81,290,543

Imposing as these figures may seem, they are, at the same time, somewhat misleading as to the actual growth and development of the business, as well as regarding its present magnitude. For example, by giving only the result of the manufacturing interests of the largest

establishments—and they are chiefly those that are centred about the great cities—they take no account of the production of the small candy-makers that are scattered about the country, which, in the aggregate, is a large amount. The great increase in the business between the years 1880 and 1890 is indicated by a gain of more than 100 per cent in the value of the production, and in the succeeding 10 years, which closed the 19th century, while the former figures would probably have been almost doubled if the aggregate production of the small and isolated candy-makers had been added to the sum of more than \$81,000,000 which represented the total output of the larger factories of the country.

Another interesting commentary upon the confectionery situation in the United States during the past century is shown by a comparison of the export and import figures in relation to the candy trade of America. Prior to 1837, all the confectionery that was imported was classed under the head of "sugar." From that year until 1847, however, the imports of candy were small, but following that period and until 1892, there was a steady if irregular increase in the total importations. By that time, however, the increased demand resulting from the growth of the home market had inspired the American manufacturer to improve the character of his production to such an extent that he was not only able to supply the requirements of the local consumer but assumed a position of such importance that he could reach out in search of wider fields and larger markets. Thus while the foundation of America's export trade was not laid until 1865, when goods to the value of \$26,429 were exported, this branch of our foreign trade has shown a fairly steady increase from that day up to the present time.

Of course, it cannot be denied that there are other factors that have played an important part in this extension of the confectionery industry. The low prices of sugar and the other materials used in the making of confectionery has exerted an influence the effect of which cannot be disregarded, while the introduction of new and improved machinery in all our candy factories has had a tendency to reduce the cost of manufacture to such a degree that the American producers have been able to make the best of goods at a cost so comparatively low as to bring them within the reach of the means of the humble purchaser.

It cannot be denied that much of the credit for this hopeful condition of affairs is due to the labors of the members of the National Confectioners' Association of the United States. This organization, which was founded in 1884, and which includes in its membership all the leading candy manufacturers of the country, has for its declared purpose, as stated in its constitution, "to advance the standard of confectionery in all practicable ways, and absolutely to prevent hurtful adulterations; to promote the common business interests of its members, and to establish and maintain more intimate relations between them; to take united action upon all matters affecting the welfare of the trade at large."

Since this association has been in existence the results of its work have been clearly manifested in the securing of necessary legislation in

CONFEDERACY — CONFEDERATE STATES OF AMERICA

the several States by means of which the manufacture or sale of all candies containing harmful ingredients or poisonous coloring matters has now been prohibited by law; by effectually stamping out all attempts at adulteration which were once so common among the makers of the cheaper grades of goods, and by the establishment in the mind of the consumer of a degree of confidence in the purity of the American product that is a strong argument for the purchase of such goods. As the result of this happy combination of circumstances we have the great American confectionery industry of to-day.

Confederacy, Daughters of the. See UNITED DAUGHTERS OF THE CONFEDERACY.

Confederate Veterans' Association, a federation of all organizations of survivors of the Civil War on the Southern side. This association was organized at New Orleans 10 June 1889. Its avowed purpose is strictly social, literary, historical, and benevolent. Its constitution says that it "will endeavor to unite in a general federation all associations of Confederate veterans, soldiers, and sailors now in existence or hereafter to be formed; to gather authentic data for an impartial history of the War between the States; to preserve relics or mementoes of the same; to cherish the ties of friendship that should exist among men who have shared common dangers, common sufferings, and privations; to care for the disabled and extend a helping hand to the needy; to protect the widows and the orphans, and to make and preserve a record of the resources of every member, and, as far as possible, of those of our comrades who have preceded us in eternity." State organizations are authorized, and are called Divisions.

REV. J. WILLIAM JONES,
President Southern Historical Society.

Confederate States of America, the name adopted by the southern States which seceded from the Union and formed a government at Montgomery, Ala., 9 Feb. 1861, comprising South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana, with Jefferson Davis of Mississippi President, and Alexander H. Stephens of Georgia Vice-President. Texas, Arkansas, Tennessee, North Carolina, and Virginia afterward joined, and Missouri and Kentucky became disputed territory, the Federal Congress and the Confederate each receiving and welcoming delegations claiming to represent those States.

The act of secession was passed by each State in full confidence that the legal right peaceably to secede was assured by the Constitution. And if the interpretation of any ambiguous provisions or expressions in any contract is to be governed by the joint intent of the parties at the time of making it, this right to secede must be conceded by all impartial historians.

Goldwin Smith, the English historian, has written: "Few who have looked into the history can doubt that the Union originally was, and was generally taken by the parties to it to be, a compact, dissoluble, perhaps most of them would have said, at pleasure; certainly on breach of the articles of union."

Henry Cabot Lodge of Massachusetts has written: "It is safe to say that there was not a man in the country, from Washington and Ham-

ilton on the one side, to George Clinton and George Mason on the other, who regarded the new system as anything but an experiment entered upon by the States, and from which each and every State had the right peaceably to withdraw, a right which was very likely to be exercised."

In 1803, at the purchase from France of the Louisiana territory, and again in 1812, at the declaration of war with Great Britain, influential and leading public men in New England not only asserted the right of secession, but urged its exercise, in the celebrated Hartford Convention (q.v.) in 1814-15.

Nowhere, however, until 1860, was the issue actually made. Had it been made in the earlier days, it would doubtless have been accomplished peacefully. But in all human affairs, political, social, moral, or commercial, there are silently but forever at work forces which make for the survival of the fittest, and the passing away of the unfit; and these forces, when at last a crisis has been reached, declare themselves, and operate with a volcanic power, against which the barriers of no constitution can prevail.

Within the lifetime of a generation the moral sense of a majority of the civilized world had grown to condemn the institution of slavery; and the invention of steam-power, railroads, and telegraphs had begun to knit communities into nations, to their great commercial advantage. The prejudices against slavery gave rise to issues between the sections of the country, which became inflamed by events—such as the raid of John Brown—until certain States were wrought up to the point of seceding.

But now—born, not legitimately of the Constitution, nor of consent between the States, (which could never have generated anything more cohesive than a rope of sand), but of inexorable laws of nature—there stood a giant in the path. Perhaps, indeed, it was of origin unsanctioned by legal form. But it was born of proximity and geographical dependency, and it was nourished by the prosperous tide of commerce already beginning to transform the entire world. It already felt itself the natural heir to the vast and rich territory within its grasp. There it stood in the way of peaceable secession—a young nation, which denied the right of secession and stigmatized it as rebellion.

In vain did President Davis plead his constitutional rights, in a message to his Congress: "We protest solemnly, in the face of mankind, that we desire peace at any sacrifice, save that of honor. In independence, we seek no conquest, no aggrandizement, no concessions of any kind, from the States with which we have lately been confederated. All we ask is to be let alone; that those who never held power over us shall not now attempt our subjugation by arms."

It needed now but a first blow to precipitate a war to the death. Concerning first blows, Richard Cobden once said: "From the moment the first shot is fired, or the first blow is struck, in a dispute, then farewell to all reason and argument: you might as well attempt to reason with mad dogs as with men when they have begun to spill each other's blood in mortal combat."

The first blow came speedily, but by deliberate intent of neither party. In Charleston a *status quo* had been agreed upon by both sides,

CONFEDERATE STATES OF AMERICA

to permit negotiations. On 25 Dec. 1860, Major Robert Anderson seized Fort Sumter. He did so by night, without orders, and contrary to his instructions, abandoning Fort Moultrie and disabling its guns. President Buchanan was about to order him to return to Fort Moultrie; but before the order could be issued the act was approved so enthusiastically by northern politicians that he did not dare to reverse it. Holding Fort Sumter, he was then constrained to dispatch an armed force to provision and supply it. Thus the Civil War was begun, the Confederates not waiting for the arrival of the armed force, but making their attack.

This breaking out of hostilities brought into the Confederacy the Border States, not so vitally interested in the subject of slavery, but with every tradition and instinct keenly alert to their legal rights under the original Constitution.

This was the real issue of the War, and not slavery, as is often loosely asserted. It is attested, not only by the titles "Union" and "Rebel," universally applied to the two armies by the North, but by the passionate claim of the Confederates that their struggle was for that liberty of self-government so dear for ages to the Anglo-Saxon race. And at the Fort Monroe conference in February 1865 between President Lincoln and Vice-President Stephens, the South's surrender of her claim to integrity of the Union was the one point upon which Lincoln insisted, and the one which Stephens could not yield, although utter destruction awaited him scarcely 60 days off. It is further shown in the desperate character of the struggle upon both sides, involving, with equal ardor, individuals and communities of most diverse degrees of interest in the question of slavery.

The combatants were very unequally matched, and as each side was in deadly earnest, the final outcome of the contest was inevitable from its beginning. On the Union side was a population of over 20,000,000, with an army, a navy, a treasury, a highly developed system of transportation by land and sea, as well as of manufactures, of commerce, and of credit. On the Confederate side was a much scattered population, almost entirely agricultural, of about 5,000,000 whites, comparatively destitute of all those elements of military strength. Even their agriculture was so little devoted to food products that actual starvation of men and horses in their armies finally hastened the inevitable end.

Besides the whites, there was a population of 3,000,000 slaves. It was believed by many at the North that if their freedom was proclaimed by President Lincoln, as a war measure, while their masters were absent in the field, they would rise in insurrection, or at least desert their labor in mass. The experiment, however, being tried, proved a failure. The slaves generally remained faithful everywhere, except in the sections overrun by the enemy. During the four years of the war there were actually mustered into the Union army 2,898,304 men. The Confederate numbers cannot be accurately known, but the total white population between the ages of 18 and 45 was, by the census of 1860, 984,475. In 1864 the ages for military service were extended to include all between 17 and 50, an act which was described by Gen. Grant as "robbing the cradle and the grave." Nearly 2,000 battles and skirmishes were fought,

and in them the number of killed and wounded on the Union side is officially given as 389,345. The numbers on the Confederate side are not accurately known, no complete records existing, but they are estimated at about 300,000.

Of lives lost in the war from battle, wounds, and disease, the official records of the Union army report 316,516. The lives lost in the Confederate army could not have been less than 250,000.

The Confederates appreciated the odds against them, but with firm conviction of the righteousness of their cause, they trusted to be able by fortitude and endurance to wear out and discourage their adversaries. The fighting was often very desperate as shown by the casualties upon both sides, which frequently exceeded the casualties of the severest battles of Europe. Upon three occasions, some historians have imagined, the Confederates were within reach of very important results.

At Bull Run, the first battle of the War, the Federals were more completely routed than ever again, and Washington might have been captured, it is supposed, had the victory been followed up. Gettysburg is considered by many to have been the crisis of the war, a desperate attack by the Confederates being repulsed. But there is strong evidence that the greatest period of discouragement on the Union side followed the battle of Cold Harbor, 3 June 1864. It was, however, of brief duration and of no effect. Successes elsewhere soon followed, and made it apparent that the Confederate resources were approaching exhaustion.

There are notable parallels between the war for the Union and the recent war between Great Britain and the Boers, in the issues involved, and in the course of their events. Like the Confederates, the whole of the Boer population considered themselves fighting for personal liberty as against subjection to a foreign power. Like the Confederates, the Boers fought practically without pay; and although they were inferior in numbers, their important engagements were generally victories; or, if not victories, were drawn battles. And as the end came to the Confederates, so it came to the Boers only with their utter exhaustion—through their being worn out, rather than defeated in battle.

But a great contrast is to be found in the treatment of the two peoples after their defeat. That of the Boer was liberal and generous, fully in accord with the civilization of the day. To parallel the treatment of the South every effort must have been made to put the political control of the country into the hands of the Kaffirs. Of course the efforts to give the negro political control over the Anglo-Saxon at the South were foredoomed to failure. They prolonged ill-feeling for 10 years; but subsequent events, notably the Spanish war, at last inaugurated a new era in which few traces of it yet linger. And it is due to history to record that it is unlikely that any such effort would ever have been made, but for the assassination of Lincoln. Although for this unspeakable crime and folly the South was in no way responsible, it brought upon her a whirlwind of resentment, and at the same time it removed a President who, there is evidence to show, had already risen to the height of his great opportunity as a statesman, and was now planning terms

CONFEDERATE STATES OF AMERICA

of liberality upon which to reconstruct the Southern States.

Within the few days that intervened between the surrender at Appomattox and the assassination of Lincoln, one in his close confidence prophesied that his plans of reconstruction would "win over the South's good will and affection, and astonish the world." And in giving his plans effect, no one can doubt that he would have had the cordial as well as powerful aid of Gen. Grant, who had already set the example of magnanimity, and won the gratitude of Lee's army by the generosity of his terms of surrender.

History records no crime greater than that of the assassin, who cheated the civilization and humanity of the world of the great example which Lincoln would have set to all nations, and who sowed bitterness and ill-will between the sections, bringing poverty and distress to the South, to the North the mortifying failure of its political experiment, and to the negro only an injury. But in connection with the negro question, as it confronts us to-day, it may be remarked that the problem of the races can be safely committed to time, and to the racial instincts implanted by the Creator.

The Constitution which was adopted by the six States in Montgomery, February 1861, and in turn accepted by the others, was modeled closely after that of the United States. It forbade the slave-trade, or the importation of slaves from any foreign country other than the slaveholding States and Territories of the United States. It forbade "bounties" or "trusts," and provided a "tariff for revenue." It allowed the President to veto any part of a bill and approve the remainder, giving his reasons for such action; and fixed his term of office at six years, and made him ineligible for a second term.

The internal history of the Confederate States during the Civil War furnished a most instructive lesson as to the weakness of the bond by which they had associated themselves. Already, before the close of the war, it had proved itself but little better than the federation of the colonies for the Revolutionary War. The last message of President Davis to the Confederate Congress, and the answering report upon the message by a committee of the Senate, contained much crimination and recrimination, and revealed an utter loss of confidence between the executive and the legislative branches, fatally paralyzing all action, and impossible to be healed. In a letter to the secretary of war, on 5 March 1865, Judge John A. Campbell, assistant secretary, wrote: "The political condition is not more favorable. Georgia is in a state that may properly be called insurrectionary against the Confederate authorities. Her public men of greatest influence have cast reproach upon the laws of the Confederacy and the Confederate authorities, and have made the execution of the laws nearly impossible." In several of the other States there were also very serious issues between State and Confederate authorities.

In view of these facts, and of the history of all confederations of many small countries, it may now be clearly seen that the prize for which the South contended so strenuously would have proven but a calamity had she won it. There would have been in the country a condition of unstable equilibrium, with many centres of disturbance, which would surely have involved further division and probably further wars. To-

day her people are citizens of a nation second to none in military renown or commercial strength, or in its power and influence for peace and civilization among the peoples of the earth. Were the right peaceably to secede, for which the South cheerfully endured all the bitterness of war, now tendered her as a free gift, every State would unanimously reject it as a curse.

Few generations of modern times have confronted sterner problems than did the men of the South in 1861. In the natural world, whenever the climate has changed, the fauna and flora have had to change to conform to new conditions. This is the law of evolution, the one great truth of which mankind may feel assured. It is not "Eternal Justice" which will prevail. It is "Conformation to Environment." And the natural resistance to change by all interests in possession, makes evolution mean war to the death of the least fit, and the survival of the fittest.

Had the South been quick to apprehend these truths, then being first published to the world by Darwin, she might have accepted compensation for her property in slaves, and surrendered her constitutional right to secede. Had she done so, over 500,000 lives, and \$10,000,000,000 of property, would have been saved.

But the Anglo-Saxon is not a ready barterer of what he deems his "rights." Nor would any nation thus founded upon "consent" have commanded confidence, or ever inspired the national pride and loyalty which form the greatest treasures of a people. The conflict, with all its death and destruction, its sorrows, and its sufferings, was but the necessary baptism of this nation, legitimating its disputed birth by a verdict in the great high court of war, rendered in accordance with the laws of evolution, beyond which there is no appeal.

But while the generation which so lavishly poured forth blood and treasure may rightfully cherish to the last an ardent affection for its "Lost Cause," with its leaders and its heroes; not only its own children, but all succeeding generations, will enjoy great and enduring benefits and blessings, the very fruit of the desperation of its struggle, and of the utterness of its defeat.

And in its influence upon national character, and upon the standing of this nation among other nations, it is no small matter to have made the record for valor and devotion to principle which the South has set; or to have produced such leaders and types as Lee and Jackson and their colleagues.

Briefly it may be said that the rise and fall of the Confederate States of America constitute the most important feature of modern history, marking the sudden birth of a great nation. Such a nation could never have been founded in peaceful debate. The world may eventually reach a stage of development where such an event may be possible, but it had not done so in 1860. Previous to that date there was no assurance of stability to the nation. Since 1865 no convulsion could shake it. Succeeding years only demonstrate to the inhabitants of every section the increasing advantages of living in an undivided and an indivisible country.

EDWARD PORTER ALEXANDER.

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CONFEDERATION

Lost Cause'; Greeley, 'The American Conflict'; Stephens, 'Constitutional View of the War Between the States'; Schwab, 'The Confederate States of America'; the Count of Paris, 'History of the Civil War in America'; Callahan, 'Diplomatic History of the Southern Confederacy'; the 'Memoirs' of Grant, Sherman, and Sheridan; and lives of Lincoln.

Confederation, Articles of. With the American resolve to be free came the necessity of a government with defined legal powers, and the Continental Congress, on the same day (10 June 1776) it appointed a committee to draft a Declaration of Independence, appointed another, one member for each colony, to frame an instrument of government. This was entitled the "Articles of Confederation and Perpetual Union," and reported 12 July; but after debate on it till 20 August, it was laid by till 8 April 1777, and not adopted till 15 November. The Congress sent a circular to the State legislatures, recommending its acceptance, and under their instructions all but five States signed it 9 July 1778, North Carolina and Georgia following on the 21st and 24th, respectively. But there had already been wrangling and heart-burning over the question of the unsettled western lands (see TERRITORIES) which, if given to the respective States according to their theoretical limits, extending to the Pacific, would have made a few overwhelmingly great, and left others too small to maintain their rights, and New Jersey, Delaware, and Maryland held aloof, insisting that the uncolonized lands should be ceded to the general government, for the common behoof of the Union whose common sacrifices must win them. New Jersey, its judgment clarified by the fact of its commerce being at the mercy of New York, protested further that the new government should have power to regulate commerce; but it signed 26 November, relying on the "justice and candor" of the rest in the territorial matter. Delaware, under protest, joined 5 May 1779, but Maryland held off nearly two years longer, till New York had ceded a blanket claim to the entire northwest, and Virginia showed signs of yielding. It finally signed 1 March 1781, and the Articles went into operation as follows:

1. "The style of this confederacy shall be 'The United States of America.'" 2. Reserving to the States full sovereignty, and all rights not expressly delegated to Congress.
3. Declaring a mutual defensive league.
4. Securing mutual citizenship of freemen, and mutual extradition.
5. Organizing a single-chamber Congress; members elected annually by the State legislatures, and subject to recall at any time; each State to have two to seven delegates, but only one vote (population not being then ascertainable).
6. Prohibiting State alliances or treaties with each other or foreign countries, grant of titles of nobility, customs dues infringing treaties already proposed, maintenance of naval or military forces except militia, or engaging in war except on declaration by Congress or imminent danger.
7. Providing for national expense by requisitions of Congress upon the States, which were to levy the needful taxes within the time set.
8. Empowering Congress (but only on the consent of nine States for the chief powers and seven for the rest) to make peace and war, treaties, etc., save that no treaty should

restrain States from laying customs duties binding on their own citizens, even up to prohibition, making it the arbiter of territorial disputes between States; empowering it to fix the standard of coins, weights and measures, to manage Indian affairs (subject to State legislation), and to regulate the postal service; to direct military and naval operations; to borrow money, and make requisitions for that and men on the States; and to appoint committees. The only function it could exercise at will, however, was to adjourn from day to day. 9. On minor matters it could delegate its powers during recess to a "committee of the States," one member from each, nine being a quorum. 10. Authorizing Canada to join, but no other colony except on vote of nine States. 11. Pledging the faith of the States for the money borrowed or appropriated by Congress. 12. Binding the States to abide by the votes of Congress and to observe all these articles inviolably, and declaring that "the union shall be perpetual"; the articles not to be altered except by vote of Congress, confirmed unanimously by the State legislatures.

The organized and carefully barricaded impotence of this scheme of government is probably unequalled in history, with any nation surviving, and is only to be accounted for by a mutual fear on the part of the States greater than their fear of the common enemy — which is usual in federations. The States were independent sovereignties, united in a league of which the first object was, not to guard against Great Britain, but against each other. Its units were the State legislatures, which made and minutely controlled it, of which the delegates were the mouthpieces, and through which every power had to be exercised; and a small minority of which could at any moment quench even its feeble vitality by recalling or not appointing their delegates. Its action was entirely confined to States; it could not even order an individual to do anything, much less compel him to do it; and even as to the States its nominal orders were only requests, which they could and did disregard. If it arbitrated their quarrels, they could disregard its decisions. A "perpetual union" but if any State chose to withdraw there was no power to prevent it except by requesting the others to wage war against it; and no power to bring it about. "Solemnly pledging" their faith to pay the requisitions and abide by the determinations of Congress, they gave no guaranty of the pledge but the empty words. Congress could pass laws and make treaties, but could not move to enforce them or punish their infraction, either by States or persons; could declare war, but not raise or maintain army or navy; could make appropriations, and constitute national departments, but not raise money to make good the one or operate the other; could borrow money, but not repay it. To cap the climax of a balance of powers which paralyzed all movement, while Congress was debarred from executing national functions, the States were debarred from exercising them; all initiative was given to one and all power to the other. And as commerce of any magnitude centred in a half-dozen seaports, the States owning them could strangle their neighbors and cripple the national revenue by levying interstate duties.

The practical result of the scheme more than fulfilled all theoretical calculations of evil. The

CONFEDERATION OF THE RHINE—CONFESSION

eight years of its duration, until the Constitution was inaugurated in 1789, cover the most deplorable and discreditable section of United States history; and foreign nations looked on with a perfectly rational expectation that the republic would shortly fall to pieces, and a fresh European struggle to become its legatees ensue. So distasteful to able men was service in this paper government, issuing edicts in the air, that political ambition sought careers rather in the State legislatures. While the Articles provided for 91 delegates from the 13 States, the actual attendance rarely rose to 30, the ratification of the treaty of peace with England was delayed for some time because only seven States were represented, nine being requisite, and it was not till 14 Jan. 1784 that nine were represented, with 23 delegates. The requisitions of Congress for money were refused or delayed, scarcely ever paid by any State in full and never on time, and generally but in small part and far in arrear. Hence, not only were the principal and interest of the debt heavily defaulted, but the very soldiers were left unpaid and almost unclothed till the end of the war, and then were only given a scanty sop in terror of their leaving the country to its enemies; and a few unpaid militia broke up the session of Congress in Philadelphia by hooting and pointing muskets at them. Treaties were made which the States and individuals on our part, and foreign nations on theirs, trampled on; American commerce was barred from the markets it held before the Revolution, the powerless Congress ignored, and the States offered treaties severally. The British government refused to surrender the north-western forts on the ground of the States refusing to keep the agreements of the treaty of peace; and the people on the frontier were subjected to the horrors of Indian warfare, which the British commandants did nothing to check, and were accused of abetting. Lastly, an insurrection in Massachusetts (see SHAY'S REBELLION) overturned civil government there for months, and showed that there was literally no power in the country to preserve public order, for the States would not let Congress do it, and could not do it themselves. This gave the final impetus to the movement which turned a commercial convention into one for remodeling the entire framework of the government (see CONSTITUTION, FORMATION OF THE), and rescuing the country from an abyss of degradation and the brink of imminent ruin. The one good piece of work to be credited to the Confederation—due to its being a paper instrument which needed no material execution at the moment—was the framing of the Ordinance of 1787, for the government of the Northwest Territory, which barred slavery from it and furnished a fighting ground for others. On 14 July 1788, the ratification of the new Constitution by the requisite nine States was announced, to be inaugurated 4 March 1789. After 1 Jan. 1789, there was no business session of the Congress of the Confederation, there being only one or two delegates present, who adjourned from day to day (the single act not requiring the assent of seven States), till 2 March, when they adjourned *sine die*. The one useful function of the Confederation was in convincing the States that they must have something better; and without the miserable practical experience of the fact they would never have admitted it. Some-

thing of the kind was an absolutely inevitable stage in the existence of the Union; and there was much honest public spirit and ability put into—but for the utility just mentioned, one would say wasted on—its attempts at action. Consult Bancroft's and Hildreth's 'Histories of the United States'; Frothingham, 'Rise of the Republic'; and Curtis, 'History of the Constitution.' See UNITED STATES—ARTICLES OF CONFEDERATION.

Confederation of the Rhine. In the war of 1805, which turned out so unfortunately for Austria, several of the princes of the south of Germany allied themselves to France. The Peace of Presburg (26 Dec. 1805) gave the first impulse to the entire dissolution of the German empire, by conferring crowns on the electors of Bavaria and Würtemberg, and on both, as well as on Baden, complete sovereignty, such as had been already exercised by the other great German states. Ultimately 16 German princes made a formal declaration of their separation from the emperor and the empire, in the act of confederation signed at Paris 12 July 1806, by the kings of Bavaria and Würtemberg, the elector arch-chancellor of the empire, the elector of Baden, the new Duke of Clèves, and Berg (Joachim Murat), the Landgrave of Hesse-Darmstadt, and other less important rulers. Other princes soon joined, and ultimately the confederacy extended over a space of 125,160 square miles, with 14,608,877 inhabitants; and the confederate forces were increased from the originally stipulated number of 63,000 to 119,180. After Napoleon's Russian campaign of 1812 the whole structure fell to pieces.

Conference. 1. In general, a meeting for consultation, discussion, instruction, or the like; or any interview for interchange of views. The term is specifically applied to consultations between committees of the two Houses of Congress in the United States, and to similar consultations between delegates of the two houses of Parliament in Great Britain. Such conferences are usually called to discuss the provisions of a bill with regard to which the two houses are disagreed, with the object of effecting an agreement between them.

2. A term much used in ecclesiastical government, etc. The annual meetings of Wesleyan preachers in England for deliberation on the affairs of the body are called conferences. In the United States the Methodist Episcopal Church has an assembly called the general conference, which meets once in four years; numerous assemblies called annual conferences; district conferences; and quarterly conferences; these assemblies variously dealing with local or general interests of the Church. In the Roman Catholic Church there are instituted pastoral conferences, chapter conferences, etc.; and in various Protestant denominations there are stated local or general assemblies of chosen delegates from individual churches, who meet to consider or adjust denominational affairs.

Conferva, kŏn-fēr'və, a genus of green algæ. Most of the species are marine, though a few are fresh-water.

Confes'sion, in law, is when a prisoner indicted of an offense, and brought to the bar to be arraigned, upon the indictment being read to him, and the court demanding what he can say thereto, confesses the offense and indictment

CONFESSION — CONFESSOR

to be true. Confession, in civil cases, is where the defendant confesses the plaintiff's right; or, in prosecutions under penal statutes, by which confession there may be a mitigation of a fine against the penalty of a statute, though not after a verdict. When the confession is entirely voluntary on the part of the accused it is admissible as evidence; but if it is obtained through fear or by promises of escape, it is not allowed. If the confession is made in answer to questions not containing, or in any way implying threats or bribes, it is then admissible. See **CRIMINAL LAW**.

It is sometimes applied to a profession of faith; for instance, the Confession of Augsburg; the Westminster Confession. (See **AUGSBURG, CONFESSION OF FAITH**). It sometimes also signifies a religious sect; as the three Christian confessions — the Roman Catholic, the Lutheran, and the Calvinistic.

Confession, Sacramental, the act of a penitent accusing himself of his sins to a priest who has power to grant absolution: it is called auricular confession because addressed to the ear (*auricula*) of the minister of the sacrament of penance, and not made in open congregation: though of course were such public confession to be made the priest would, unless the laws of the Church should forbid, possess the same power of absolution as in auricular confession. The law of the Catholic Church as defined by the Council of Trent, requires that the faithful shall confess to a duly commissioned priest all their mortal sins, and advised to confess venial sins, committed after baptism and since a previous confession and absolution, so far as they can recall them by a diligent examination of their conscience. The penitent is strictly required to confess all his mortal sins, their kinds and their number as well as he can recall them: wilful concealment of a mortal sin or even of what the penitent may erroneously deem a mortal sin, renders the confession of the penitent and the absolution of the minister null, and both of these acts must be done over again and made good. If a penitent, after examination of his conscience, fails to recall any mortal sin he is under obligation to confess that sin afterward and to receive absolution for it. See **ABSOLUTION**.

Confession of Faith, Westminster, a document prepared by the Assembly of Divines which met at Westminster in obedience to an ordinance of Parliament issued 12 June 1643. The whole number of the Assembly amounted to 174 members, 32 of whom were members of Parliament appointed as lay assessors. The greater part of the Assembly were Puritans. One of the chief results of the deliberations of the Assembly was the framing of the Confession of Faith, intended to be that of the national Church of Great Britain. In England it nominally held this position for a short time. On the return of the Scottish commissioners it was laid before the General Assembly of the Church of Scotland, by whom it was adopted as the creed of the Church by the act of Assembly of 27 Aug. 1647. It has been adopted by the other Presbyterian churches generally, in some cases, however, with certain reservations. Its theology and discipline are thoroughly Calvinistic. See **CREEDS; WESTMINSTER ASSEMBLY**.

Confessional, in Roman Catholic churches and chapels, a kind of enclosed seat in which the priest sits to hear persons confess their sins. The confessional is often not unlike a sentry-box, the priest sitting within and the penitent kneeling without and speaking through an aperture. Many confessionals are in three divisions or compartments, the centre, for the reception of the priest; the side compartments, which communicate with the centre by grated apertures, are for the penitents.

Confessions of an English Opium-eater, The, a work by Thomas De Quincey, first published in the 'London Magazine' during 1821. The book is one of the most brilliant in literature. As an English critic has said, "It is not opium in De Quincey, but De Quincey in opium, that wrote the 'Suspiria' and the 'Confessions.'" All the essays are filled with the most unexpected inventions, the most gorgeous imagery, and, strange to say, with a certain insistent good sense. As a rhetorician De Quincey stands unrivaled.

Confes'sions, Les, an autobiographical work of Jean Jacques Rousseau. It was written during the six most agitated years of his life, from 1765 to 1770; and his state of health at this time, both mental and bodily, may account for some of its peculiarities. The first six books were not published until 1781, and the second six not until 1788. According to more than one critic, the 'Confessions,' however charming as literature, are to be taken as documentary evidence with great reserve. They form practically a complete life of Rousseau from his earliest years, in which he discloses not only all his own weaknesses, but the faults of those who had been his friends and intimates..

Confessions of Saint Augustine, The, the autobiographic memoirs of Saint Augustine, written in 397. It is divided into 13 books. The first 10 contain an account of his life down to his mother's death, and give a thrilling picture of the career of a profligate and an idolater who was to become a Father of the Church. Side by side with the pictures he paints of his childhood and of his wayward youth and manhood, we have his variations of belief and his attempts to find an anchor for his faith among the Manichæans and Neo-Platonists, and in other systems that at first fascinated and then repelled him, until his conversion at the age of 32. The narrative is intermingled with prayers (for the Confessions are addressed to God), with meditations and instructions, several of which have entered into the liturgies of every section of the Catholic Church. The last three books treat of the opening chapters of Genesis, of prime matter, and the mysteries of the First Trinity. They are, in fact, an allegorical explanation of the Mosaic account of the Creation.

Confessor, in the Roman Catholic Church has two principal significations. 1. Denoting a canonized male saint outside of the classes of the apostles, evangelists, and martyrs. The only saints, who in the earliest times were publicly venerated in the Church after death were, in addition to the Blessed Virgin and the apostles, the martyrs; and such are all the saints named in the Roman canon of the Mass, though the Milan canon (Ambrosian) has the name of other saints. 2. The other meaning of the

word confessor, the priest who hears confessions, answers to the more correct Latin word *confessarius*. The confessor, minister of the sacrament of penance, does not exercise that ministry simply in virtue of his having received priestly order: he must receive jurisdiction from the bishop of the diocese. The general law of the Church requires each of the faithful to resort to the confessional at least once in every 12 months, and to make confession each to his own parochus or parish priest: but under the law they may now lawfully confess to any priest who has due authorization from the bishop.

Confidential or Privileged Communication, in law, a communication made by one person to another which the latter cannot be compelled to give in evidence as a witness. The laws of the United States and of some other countries are, that all communications made between a client and his agent, between the agent and the counsel in a suit, or between the several parties to a suit, shall be treated as confidential; but in some minor points the practice varies in the different States. Legal agents are of course required to produce any papers intrusted to them by their clients, which the clients themselves would otherwise have been required to produce. The privilege of confidentiality regarding disclosures made to a medical adviser, even although it may have been necessary for the patient to make them in order to enable the physician to understand and treat his case, have not been defined by statute, but the custom has been that such communications are privileged. The same holds true regarding confessions made to a priest. No instances are cited where the confession of a penitent has ever been revealed by a priest. Communications made between husband and wife during marriage are in some States not admissible as evidence, although in most civil cases a husband and wife may legally be called as witnesses against each other. The laws in the United States differ in different States regarding the admission of testimony of husband or wife for or against each other.

Confirma'tion, one of the seven sacraments of the Roman Catholic Church; in the Lutheran, the Anglican, and the Protestant Episcopal Church confirmation is not a sacrament, but only a solemn rite wherein the one who is confirmed renews in the face of the Church the promises made on his behalf by his sponsors in baptism. In the early times of the Catholic Church the sacrament or rite of confirmation was administered immediately after baptism, even of infants: hence the two rites have often been even by orthodox writers viewed as one; and in the Greek and Oriental churches this custom still persists. But in the present discipline of the Latin Church confirmation is usually not administered till about the 12th year, though a child might be held competent to receive it at the age of 7. It is customary for the confirmant to take an additional name as a memorial of the rite. In administering it the bishop — and the bishop is the ordinary minister of this sacrament — with chrism (q.v) marks the sign of the cross on the forehead of the recipient, and gives him a gentle slap on the cheek, in signification that he must be ready to suffer for Christ's name's sake. The formula of words used by the bishop in signing the confirmant is, "I sign thee with the sign of the

cross and I confirm thee with the chrism of salvation, in the name of the Father, and of the Son, and of the Holy Ghost."

Confisca'tion, the act of condemning as forfeited, and adjudging to the public treasury, the goods of a criminal in part punishment of a crime. The subject of confiscating the property of those in rebellion was warmly discussed both in and out of the United States Congress, at the beginning of the Civil War. A bill "to confiscate property used for insurrectionary purposes," etc., approved 6 Aug. 1861, providing for the immediate confiscation of all property belonging to office-holders under the Confederate government, and confiscation, within 60 days after the President's Amnesty Proclamation, of all property belonging to disloyal citizens or privates in the Confederate army, was passed by the House 11 July 1862, and the Senate the next day; and after a slight modification suggested by the President in his veto of the same, on constitutional grounds, it was again passed by both Houses on the 16th, and approved, becoming a law the next day. On 22 July the President issued an order that property needed for the support of the armies of the United States should be seized, an account being kept of the same.

Conformity. When strata of sedimentary rocks succeed one another in unbroken order with parallel bedding planes, and have been affected similarly by earth movements, they are said to be conformable, and the structure is a conformity. A false conformity is when, on an eroded surface of horizontal strata, other strata have been laid down. In such a case there may be an enormous time-break, millions of years, between the two series of strata, yet apparently, from a single rock outcrop or the outcrops in a small area, there is no break. Such false conformities are not uncommon in the Rocky Mountains, and, if the strata are not fossiliferous, are very difficult to detect.

Confucius, kōn-fū'shī-ūs (Latinized form of Chinese K'ung-fu-tzu), Chinese philosopher: b. province of Shantung about 550 B.C.; d. 478 B.C. His father, Shuh-liang-heih, who was of royal descent, died three years later, and the boy was reared in comparative poverty by his mother, Ching-tsai. At the age of 17 he was made inspector of corn-markets; at 19 he married; and some four years later he began his career as a teacher. In 517 B.C. he was induced by two members of one of the principal houses in Lu, who had joined his band of disciples, to visit the capital with them, where he had interviews with Lao-tze, the founder of Taoism. Though temporarily driven from Lu to Tsi by a revolution, he soon returned thither with an increasing following, and at the age of 52 was made chief magistrate of the city of Chung-too. So striking a reformation was effected by him that he was chosen for higher posts, became minister of crime, and with the aid of two powerful disciples elevated the state of Lu to a leading position in the kingdom. Its marquis, however, soon after gave himself up to debauchery, and Confucius became a wanderer in many states for 13 years.

In 483 he returned to Lu, but would not take office. The deaths of his favorite disciples Yen Hwin and Tze-lu in 481 and 478 did much to further his own, which took place in the latter year. Confucius left no work detailing his

moral and social system, but the five canonical books of Confucianism are the "Yih-king"; the "Shu-king"; the "Shi-king"; the "Le-king"; and the "Chun-tsien"; with which are grouped the "Four Books," by disciples of Confucius, the "Ta-hëo or Great Study"; the "Chung-Yung or Invariable Mean"; the "Tun-yu or Philosophical Dialogues"; and the "Hi-tse," written by Meng-tse or Mencius. (See SACRED BOOKS OF THE EAST.) The teaching of Confucius has had, and still has, an immense influence in China, though he can hardly be said to have founded either a religion or a philosophy. All his teaching was devoted to practical morality and to the duties of man in this world in relation to his fellowmen; in it was summed up the wisdom acquired by his own insight and experience, and that derived from the teaching of the sages of antiquity. Consult Legge, 'Religions of China'; Douglas, 'Confucianism and Taoism'; Plath, 'Confucius und seiner schüler Leben und Lehren.'

Confusion, in mental diseases acute confusion occurs in the early stages of general paralysis, in acute mania, in melancholia, in dementia precox, and in most of the insanities. It might be called an initial symptom of insanity. The characteristic symptoms are lack of correct appreciation of external expressions, loss of continuity of thought, with a certain enfeeblement of judgment. There are certain insanities characterized purely by acute confusion. See INSANITY.

Confu'so River, Paraguay, a tributary of the Paraguay River. After a winding course in the Gran Chaco, it "pours into the Paraguay, near Villa Hayes, waters as salty as the ocean itself."

Congaree, kōn-ga-rē', a river of South Carolina, formed by the union of the Broad and Saluda, at Columbia, near the centre of the State. After a course of about 50 miles it joins the Wateree, and the united streams take the name of the Santee, which is navigable by steamboats to Columbia.

Cong'don, Charles Taber, American journalist: b. New Bedford, Mass., 7 April 1821; d. New York 18 Jan. 1891. He edited for a time the organ of the People's Party in the Dorr Rebellion in Rhode Island, 1842. From 1857 to 1882 he was on the editorial staff of the New York *Tribune*, and a frequent contributor of critical and literary articles to the magazines. He published: 'Tribune Essays' (1869); 'Reminiscences of a Journalist' (1880).

Congé d'Élire, kōn-zhā-dā-lēr (Fr. "leave to elect"), in England, the sovereign's warrant authorizing the dean and chapter of a vacant see to proceed with a new election. The nomination to bishoprics, originally understood to have been vested in the Christian people, who made it by election, was afterward transferred to the sovereigns of most states, and remained with them till the 11th century, when, by the assistance of the Pope, it was wrested from them and conferred upon the clergy. In England, the Constitutions of Clarendon, in 1164, conferred the election on the chapters, and this right was formally confirmed by Magna Charta, subject, however, to a right in the sovereign to grant a *congé d'élire*, and also to confirm the chapter's choice. Thus matters remained till the Reformation, when

the crown made a very important encroachment, and provided by 25 Henry VIII. c. 20, that though the dean and chapter were still required to go through the form of an election, the person to be chosen should previously be absolutely fixed by the sovereign. This act is still the regulating statute, and not only provides that on every vacancy in a see the sovereign may grant a license to proceed to the election of a successor, and with it a letter containing the name of the person to be elected, but that if the dean and chapter delay the election beyond 12 days, or elect any other person than the one named in the letter, or do anything else in contravention of the act, they incur the penalties of a *præmunire*, that is, forfeiture of goods, deprivation of certain civil rights, and imprisonment. Any bishop or archbishop neglecting to assist at the consecration and investment of the bishop-elect, within 20 days after the legal announcement of his election, is liable also to the penalties of *præmunire*.

Congenital Disease, a disease which the new-born child inherits from its father or mother, or it may be its grandparents. Such diseases are extremely rare. Syphilis, gout, congenital anomalies such as hare-lip, web fingers and toes, etc., are among the few truly congenital diseases. During child-birth children may acquire infections, but these are not truly congenital diseases.

Conger, kōn'gèr, Edwin Hurd, American diplomatist: b. Knox County, Illinois, 7 March 1843; d. Pasadena, Cal., 18 May 1907. He was graduated at Lombard University in 1862, served in the Union army 1862-5, studied law and was graduated at the Albany Law School in 1866. He began the practice of his profession in Galesburg, Ill., removing to Iowa in 1868. He was elected to Congress in 1884 and twice re-elected as a Republican. In 1890 he was appointed minister to Brazil, serving four years. In 1897 he was again appointed to that post and in the following year was transferred to China. He was at his post throughout the Chinese crisis of 1900, in Peking, being imprisoned with his family and the entire diplomatic corps in the British legation compound from 20 June to 15 August. His rescue on 20 August was effected by the allied powers barely in time to save him and his colleagues from a general massacre. He was appointed ambassador to Mexico early in 1905 but resigned in August of that year.

Conger Eel, a species of marine eel (*Leptocephalus conger*) with a long dorsal fin reaching forward nearly to the head and continuous posteriorly with the caudal; the pectoral fins present; strong, close-set teeth in the jaws; mouth and eyes large, and scales absent. The conger is a large eel, the ordinary specimens commonly captured along the New England shores being four feet long, while those taken in the open sea are six to eight feet, and weigh 50 to 60 pounds, or in rare cases upward of 100 pounds. Very little is known of their habits in the natural state, but they are easily kept in aquaria and are known to be ravenous creatures, which devour fishes, crustaceans, and mollusks, and even the smaller members of their own species. From observations made on specimens in captivity in England Dr. Cunningham has concluded that, as in many other fishes, spawning takes place

CONGESTION — CONGREGATIONALISM

but once; the females, upon the approach of that period ceasing to feed and undergoing degenerative changes in respect to the skeleton and other parts. Spawning occurs in the deep sea and during development a transparent band-like larva is formed which was long ago described as a distinct genus under the name of *Leptocephalus*. The conger is a prolific fish, producing about 3,000,000 eggs. After nightfall the conger eel may be induced to take the hook and affords good sport.

Congestion, an abnormal amount of blood in the vessels of a part causes a condition of congestion. This may be present in the arteries or in the veins, arterial or venous congestion respectively. In the former case it is usually due to some acute inflammatory reaction, causing rapidity of the heart beat or dilatation of the blood vessels with consequent congestion in some area. In venous congestion, as a rule, the cause is due to some constriction to the venous return to the heart. See **COLD**.

Congleton, kŏn'gl-tŏn, England, a market town and borough of Cheshire, in a deep valley, on the Dane, 24 miles south of Manchester. Among the chief buildings are the town hall, and the grammar-school. Congleton is a seat of the silk manufacture, ribbons, handkerchiefs, and other articles being made; it also carries on fustian-cutting, the manufacture of agricultural implements, rope-making, brewing, etc. Near it are collieries and quarries. Pop. 10,000.

Conglom'erate, or **Puddingstone**, a firm rock made up of rounded detrital pebbles and even boulders, the interstices usually filled with sand. Silica is the commonest cementing material, calcite, and limonite coming next. The pebbles and boulders may be of any kind of rock, though quartz and quartzite are the most frequent, since the most resistant material in gravels. According to the character of the pebbles, different names are given, as quartz conglomerate, limestone conglomerate, etc. Conglomerates grade through pebbly sands and sandstones into true sands and sandstones. Under dynamic stress, in the folding of rock strata, the pebbles of a conglomerate may be much distorted, and by further metamorphism a conglomerate may pass into a gneiss. A conglomerate is a sedimentary rock. Some notable conglomerates are the copper-bearing Calumet and Hecla conglomerate on the Keweenaw Peninsula, Michigan, of Algonkian Age; the great conglomerate at the base of the coal measures of Carboniferous Age, in Pennsylvania and adjacent States; the Roxbury conglomerate of uncertain age, near Boston, Mass.; and the famous "banket," possibly of Permian Age, on which are located the great gold mines of the Transvaal. See **BRECCIA**; **GNEISS**; **ROCK**; **SANDSTONE**.

Congo. See **KONGO**.

Congo Free State. See **KONGO**.

Congo Snake. See **KONGO SNAKE**.

Congrega'tion, a gathering or collection of persons; usually a religious assembly; in its most ordinary use, an assembly of Christians met in one place for worship. In the Roman Catholic Church, it often designates a sort of board of cardinals, prelates, and divines, to which is intrusted the management of some im-

portant branch of the affairs of the Church. Thus the Congregation of the Index examines books and decides on their fitness for general perusal. The *Congregatio de Propaganda Fide* is instituted for the propagation of the Roman Catholic faith and the government of the Church in non-Catholic countries. The Congregation of Relics inquires into the genuineness of supposed relics. The Congregation of the Holy Office takes cognizance of heresies, etc. The Congregation of Rites regulates the festivals and offices of new saints. There are numerous other Congregations. The word is also used in the Roman Catholic Church to describe communities of ecclesiastics who live together under rule, but without being bound by vow, or at least by solemn vow. Such are the Congregation of the Oratory, the Congregation of the Most Holy Redeemer, usually called Redemptorists, etc.

Congregational Methodist Church, an ecclesiastical body in the United States, organized in Monroe County, Ga., by seceders, lay and clerical, from the Methodist Episcopal Church, in 1852. The movement was in the direction of a more democratic or congregational polity, designed to give the members of individual churches larger and more direct control of their own affairs; but the body still preserves the more essential forms of organization and procedure, such as the conference system, etc., characteristic of the Methodist Episcopal Church. It has a membership of over 20,000 distributed among about 350 churches.

Congregationalism had its origin in an attempt in England to carry the principles of the Protestant Reformation regarding the authority of Scripture to their radical consequences. Accepting the Bible as the sole rule of faith and practice, the founders of Congregationalism sought to find in it not merely an authoritative source of Christian doctrine; but, also, a complete, adequate, and binding pattern of church government and organization. They grew out of the Puritan party of the reign of Queen Elizabeth, of which party they were the most advanced wing. They shared fully the intense Calvinism of that party and differed from it only in matters affecting church organization and government. The great majority of the Puritans held to the conception of a national Church, of which all baptized and non-excommunicated inhabitants of the kingdom were members. The reformation of this Church, though earnestly to be sought by private Christians, they viewed as ultimately the work of the national government, and hence they held it to be a duty to remain in the Church of England, while laboring for what seemed to them its betterment. This reformation involved, in the conception of the Puritans generally, the establishment everywhere of a learned, earnest, preaching ministry; of efficient discipline; of what they deemed a more scriptural organization of the Church; and the disuse of such vestments and forms of worship as seemed to them to be without Biblical authority or to savor too strongly of Roman usages.

The founders of Congregationalism sympathized with these aims and criticisms of the Puritans, but, unlike the majority of that party, they believed that the reforms which they desired in the Church of England should come about through individual initiative, by the separation

CONGREGATIONALISM

from that Church of those who criticised it. Hence the early Congregationalists of England were called "Separatists." They rejected the thought of a national Church. They held that the only proper form of the visible Church is the local congregation, composed of a company of professed disciples of Christ who can claim personal religious experience, and are united to Christ and to one another by a voluntary covenant which transforms a company of Christians into a Church. Of these congregations Christ is the immediate head. Each, they conceived, is completely self-governing, choosing its own officers and administering its own discipline. While no earthly authority outside of such a Church has jurisdiction over it, each such congregation owes advice and aid to its sister congregations as necessity may require. This mutual responsibility and helpfulness has always led American Congregationalists to reject the name "Independent" which is popularly attached to the churches of this order in Great Britain. The officers of such a local Church were conceived by the founders of Congregationalism, following what they thought the New Testament model, to be a "pastor," and a "teacher" who should preach and administer the sacraments; a "ruling elder" who should aid the "pastor" and "teacher" in the administration of discipline; "deacons" to administer the financial affairs and charities of the congregation, and "widows" to care for those in illness and the poor. In their revolt from the prescribed liturgy of the Church of England they held that public prayer should be wholly free; and, like the Calvinists generally, they gave the chief place in public worship to the sermon.

Though Richard Fitz and his associates, whose congregation at London was broken up by the English government in 1567, may be deemed the earliest organized Congregationalists, the first clear presentation of Congregational principles was made in the works of Robert Browne, a graduate of the University of Cambridge in 1572, who passed from Puritanism to Separatism, probably in 1579, organized a church at Norwich in 1580 or 1581, and issued a series of tracts in defense of his views, from his exile at Middelburg in Holland, in 1582. Though Browne not long after conformed to the Church of England, a similar work was taken up by others, notably by Henry Barrowe, a lawyer of London, and Rev. John Greenwood and Rev. Francis Johnson in the same city, where a Congregational Church was organized in 1592. In 1593 Barrowe, Greenwood, and Rev. John Penry were hanged at London for opposing the ecclesiastical authority of Queen Elizabeth, and the Church in London was driven into exile. It found a refuge in Amsterdam under the pastoral care of Francis Johnson and Henry Ainsworth.

Contemporaneously with the later of these events, an apparently independent movement in the vicinity of Gainsborough and Scrooby, led at first by William Brewster, the postmaster at Scrooby, Rev. Richard Clyfton, rector at Babworth, and later also by Rev. John Robinson and Rev. John Smyth, resulted in the organization, about 1606, of congregations at Scrooby and Gainsborough, which were compelled to seek refuge speedily in Holland. That of Scrooby settled, in 1609, at Leyden under the pastoral care of Robinson, and a portion of this

congregation, led by William Brewster, William Bradford, and Edward Winslow, crossed the Atlantic in the Mayflower, and laid the foundations of Plymouth Colony in 1620, thus establishing the first of the Congregational colonies in America.

The settlers of Plymouth were Separatists, but during the years immediately succeeding their establishment in the New World the course of politics in England under James I. and Charles I., was such as to lead many of the Puritans to despair of the attainment of the reforms they desired in Church and State in the home land. The consequence was a large Puritan emigration across the Atlantic; and the establishment, in the course of a decade (1628-38), of the three Congregational colonies of Massachusetts Bay, Connecticut, and New Haven. These Puritan settlers were all led by the radical development of their own principles in a new environment, and the influence of Plymouth example, to establish churches on the Congregational model, at their settlement in New England.

These colonies differed slightly from one another in the degree in which they applied theocratic principles to the organization of the State. In Massachusetts from 1631 to 1664, and in New Haven from 1639 to 1665, when New Haven was absorbed in the Connecticut Colony, the franchise was confined to church members. In Connecticut and Plymouth colonies no such restriction existed. Doctrinal discussion aroused by Mrs. Anne Hutchinson and her adherents at Boston occasioned the meeting of the first "Synod" or council representative of the Congregational churches of New England, in 1637. At the Cambridge Synod, in 1648, these churches, by their pastors and delegates there assembled, adopted the "Cambridge Platform" as a compact manual expressive of their views of the organization, officers, and discipline of the churches. The first century of New England Congregationalism saw, however, little theological debate, for the New England churches stood on the common doctrinal ground of Calvinistic Puritanism. The chief controversy of this period was that regarding church membership known as the "Half Way Covenant" discussion. In the view of the founders of Congregationalism the reception of a parent to church membership by "owning the covenant" involved the admission into church membership of his immature children. But adult membership implied experimental Christian character. When the children of the first settlers began to grow to maturity the question of their status forced itself, therefore, on the attention of the churches. A ministerial convention, representative of Massachusetts and Connecticut, held at Boston in 1657, and a "Synod" of the Massachusetts churches convened in 1662, decided that such as were church members in childhood by reason of their parents' membership, could, when they in turn became parents, bring their children to baptism, and could confer upon such children the same degree of membership which they themselves possessed; but unless consciously and personally of Christian experience could not vote on ecclesiastical questions or partake of the Lord's Supper. Hence a distinction between members in "full communion" and in "half way covenant" was made, which continued till early

CONGREGATIONALISM

in the 19th century, when it disappeared, largely owing to the opposition which Jonathan Edwards and his disciples had manifested to it from 1749 onward.

Congregationalism, like the Calvinistic churches in general, believed in the necessity of education, and therefore the New England colonies speedily after their foundation established schools, and planted Harvard College in 1636. Yale College followed in 1701. This spirit has characterized Congregationalism throughout its history and has led Congregationalists to be pre-eminently founders of schools and colleges as they have extended westward in the United States. The elaborate system of church officers already described, and believed by the founders of Congregationalism to be scriptural, outlasted the first generation of the settlers of New England in only a few instances. While they existed "pastor," "teacher," and "ruling elder" all received salaries from the churches they served; but in most of the New England churches "teachers" and "ruling elders" soon disappeared, leaving only a pastor and a variable number of deacons. The more modern growth of organization and methods of Christian work has led to the establishment of other officers, such as a clerk, a treasurer, a Sunday-school superintendent, and often one or more standing committees, and no feeling now exists that officers should be limited to those mentioned in the New Testament as possessed by the early Church. The pastor remains, with rare exceptions, the only salaried officer. The support of public worship which was originally by voluntary gifts, and has always been so in Great Britain, became, between 1638 and 1655, a matter of public taxation in all the Congregational colonies. In Connecticut this relation to the State which made Congregationalism practically a State-supported Church lasted till 1818, and in Massachusetts till 1834; but since the latter date Congregationalism has nowhere enjoyed State aid.

The high-wrought spiritual impulse manifested by the first settlers of New England was followed by a period of decreasing religious interest affecting the second, third, and fourth generations on New England soil. This condition was terminated by a series of "revivals," of which the first manifestation was in that at Northampton, Mass., under the pastorate of Rev. Jonathan Edwards in 1734, and of which the culminating expression was witnessed in the two years following the preaching tour of Rev. George Whitefield in 1740. This spiritual quickening is known as the "Great Awakening," and undoubtedly added many to the membership of the churches. It was marked, however, by much excitement, and was followed by a period of spiritual decline lasting through the troubled years of public conflict and debate which ended with the adoption of the Constitution of the United States. It resulted in serious controversy in the churches of New England as to its merits, those who opposed it as on the whole harmful being called "Old Lights" while those who favored it were nicknamed "New Lights."

In the teachings of Jonathan Edwards (1703-58) a theological movement of importance in American religious history began; and the modified Calvinism of the Edwardean school was further developed by Joseph Bellamy (1719-90), Samuel Hopkins (1721-1803), the younger Jona-

than Edwards (1745-1801), Timothy Dwight (1752-1817), and Nathanael Emmons (1745-1840) into a distinctive New England theology. In eastern Massachusetts, on the other hand, a "liberal" school arose before the American Revolution, which grew slowly and was made clearly evident in the Unitarian separation of the early years of the 19th century—a separation that had its most conspicuous manifestation in the adherence of Harvard College to the "liberal" side in 1805, though the full significance of the division was not apparent until 10 years later.

With the decade beginning in 1791, the Congregational churches of New England experienced a series of revivals which were repeated at intervals until 1858. Under these impulses not only was the membership of the churches much enlarged, but a rapid development of agencies for missionary evangelization and religious education took place. The churches of Connecticut, which had already done home missionary work in Vermont and New York for more than 20 years, organized their "General Association" in 1798 as the "Missionary Society of Connecticut." A missionary society was formed in Massachusetts in 1799. In 1801 the "New Hampshire Missionary Society" was inaugurated, and in 1807 a similar organization was effected in Vermont. These societies were chiefly engaged in home missions in the then western States and Territories, though some work was done by them among the Indians; but in 1810, the "American Board of Commissioners for Foreign Missions" came into being and enlisted the activities of the Congregational churches in evangelization abroad. This society was followed, in 1815, by the formation of what is now known as the "Congregational Education Society" for assisting ministerial candidates and institutions of learning. In 1826 an "American Home Missionary Society," now known as the "Congregational Home Missionary Society" was organized to undertake home missionary work. These were followed later by the formation of the "American Missionary Association," in 1846, for labor, especially, among the negroes and Indians of the United States—a society which has done a large missionary and educational work in the South since the Civil War. In 1853, the "Congregational Church Building Society" came into being, under the title of the "American Congregational Union"—an organization the work of which is sufficiently described by its more recent name. All these societies still exist and serve as agencies for the missionary activities of the Congregational churches of the United States.

Contemporary with this awakening of missionary activity and immediately consequent upon the passage of Harvard University to the "liberal" side, occurred an extensive development of theological education, beginning with the opening of Andover Theological Seminary in 1808. Bangor Theological Seminary was founded in 1816; and, in 1822, the theological department of Yale University was organized. Local disputes in Connecticut growing out of the modified type of Edwardean theology presented by Prof. Nathaniel W. Taylor of Yale, led to the organization, in 1834, of what is now known as "Hartford Theological Seminary." The theological department of Oberlin College came into existence in 1835, and the westward growth of the denomination brought about the opening of "Chicago Theological Seminary" in 1858, and

CONGREGATIONALISM

of "Pacific Theological Seminary," now at Berkeley, California, in 1869. The latest school for ministerial training is that opened at Atlanta, Georgia, in 1901. These eight theological seminaries are the principal agencies for the training of the ministry of the Congregational churches of the United States. The Congregationalists of Canada have a seat of ministerial education in the "Congregational College of Canada," established in 1830, and now affiliated with McGill University at Montreal. In Great Britain no less than 11 Congregational "colleges" do a work similar to that of the "theological seminaries" on this side of the Atlantic.

To the close of the 18th century the Congregational churches of the United States were practically confined to New England; and, in the subsequent westward extension of New England emigration, Congregationalism and Presbyterianism long worked together in the formation of churches in the newer states under the so-called "Plan of Union" of 1801. This "Plan" was repudiated by the "Old School" wing of the Presbyterian body in 1837, and by the Congregational churches, through the "Albany Convention," in 1852. Congregationalism has now extended in force to those parts of the United States, especially, which have been settled through New England emigration. Throughout the latter half of the 19th century, the Congregational churches of the United States have felt an increasing denominational consciousness, which has found its expression, among other ways, in the gathering of bodies representative of these churches as a whole. A "Convention" met at Albany in 1852, a "National Council" at Boston in 1865, and since 1871 a "National Council" has met every three years. Besides this "National Council" in which delegates of the churches of the United States are regularly assembled, the churches of each State are represented in an annual "Conference," "Convention," or "Association"; and the churches of smaller districts, usually counties, meet in more local "Conferences" or "Associations." None of these bodies are in any sense courts of discipline, but they gather for deliberation, consultation, and joint action by committees, or otherwise, in matters of common concern.

Each Congregational church is a self-governing body, capable of choosing its own officers, expressing its creed in such forms as seem best to it, determining the conditions for the admission of its members, and ordering its public worship as it deems most fitting. But while a Congregational church is a self-governing democracy, Congregationalism, always in the United States, and increasingly in Great Britain, has insisted that its churches are knit together in sisterly fellowship, and owe, therefore, to one another, advice in all matters of importance, discipline in evident error, and mutual helpfulness. Hence in questions of serious ecclesiastical concern, such as the settlement or dismissal of a pastor, the management of a case of discipline which the local church finds it impossible to handle, the organization of a new church, and the like, Congregational usage in the United States, though not in Great Britain, requires the summons of an "advisory council" composed of a variable number of churches, chiefly from the vicinity, which are represented in the council by their pastors and a delegate

each. These councils oftentimes also include a few individuals summoned by name as experts in the matter under consideration. By such an "advisory council," met for the particular occasion, advice is given; and, though this advice is not obligatory, it is seldom that the opinion of such a council is disregarded.

Membership in a Congregational church is conditioned on the vote of the local church itself, in view of the candidate's profession of faith in Christ, evident determination to live a Christian life, and acceptance of the covenant obligations of Christian service in connection with the local company of Christian disciples of which he desires to become a member. While all matters of concern in a local congregation are determined, ultimately, by the votes of the membership, Congregational churches transact their business chiefly through the use of committees, and a standing "prudential committee" to assist the pastor and deacons is appointed in most churches of numerous membership.

But while each church is thus free to establish such a test of the faith of candidates for its membership as it deems proper, Congregationalists in representative assemblies or in a more informal way, have always been ready to testify to their faith by public creed declarations. Examples of such witness-bearing have been the approval of the doctrinal portions of the Westminster Confession by the New England churches by the Cambridge Synod in 1648; the modification of that confession by delegates of the English churches gathered at the "Savoy," London, in 1658, and its publication as the "Savoy Declaration"; and the substantial confirmation of this "Declaration" by the churches of Massachusetts in 1680, and of Connecticut in 1708. Later examples of the same readiness of Congregationalists to witness to their beliefs is seen in the "Principles of Religion" adopted by the "Congregational Union of England and Wales" in 1833; the "Burial Hill Declaration" approved by the "National Council" of the United States in 1865; and the "Commission Creed" issued by a committee of the same American body in 1883. All of these statements have been regarded, however, as testimonies rather than as tests of ministerial fitness or church-fellowship.

Aside from its representation in the United States, Congregationalism is strongly entrenched in Great Britain, where its adherents are often known by the name "Independents." The churches of this order in Great Britain are grouped together in county and district "Unions" and "Associations" and are represented in the "Congregational Union of England and Wales" and the "Congregational Union of Scotland." In general, however, the Congregational churches of Great Britain have emphasized mutual accountability and organization into representative bodies much less than those of the United States. Congregationalism is creditably represented in the Dominion of Canada and in Australia, as well as on missionary soil, where the two extensive Congregational missionary agencies, the "American Board," and the "London Missionary Society," have labored. An "International Council," representative of all lands in which Congregationalism has found a home, held its first session at London in 1891, and its second at Boston in 1899.

CONGREGATIONS

The statistics of the Congregational churches ('Year Book' for 1902), are as follows:

Churches in the United States.....	5,753
“ “ Great Britain	4,873
“ “ Canada and New Foundland	137
“ “ Australia, New Zealand, and Tasmania	349
“ “ Jamaica and British Guiana.....	120
“ “ South Africa	308

The churches of the United States reckoned their members at 647,225, those of Great Britain 436,279, while those of the other districts above mentioned amounted to 43,025. The Congregational ministers on the roll in the United States, as given in the "Year Book" for 1902, numbered 5,717. The enrollment in Congregational Sunday-schools of the United States was 658,405. The home expenses of the churches of the United States for the year 1901 were \$7,580,665; their benevolent contributions \$2,233,722.

The "American Board of Commissioners for Foreign Missions" by which the missionary work of Congregational churches of the United States is carried on, reported the following statistics for the year 1902: Mission stations, 101; out stations, 1,301; American missionaries, 549; native laborers, 3,581; churches, 524; communicants (members), 55,645, of whom 5,609 had been added during the previous 12 months. The "London Missionary Society," through which the foreign work of the churches of Great Britain is chiefly carried on, reported, during the same period, 1,357 stations and out stations, 437 missionaries, 6,203 native laborers, and a church membership of 64,716, of whom 6,657 had been added the previous year.

While the title "Congregational" designates a particular fellowship of churches, or religious denomination, in the United States and Great Britain, the Congregational form of church organization, especially in its aspect of the self-government of the local congregation, is that of many other religious bodies, notably of the Baptists, the Christians, the Unitarians, and of certain branches of the Adventists, and Lutherans, so that the Congregational polity is much more widely extended than the adherents of the churches which officially or popularly bear the Congregational name.

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Congregations, Religious, communities or orders, bound together by a common rule either without vows or without solemn vows. In France the name is so used as to include associations or confraternities of the laity. A group of monasteries is sometimes called a Congregation; when they unite themselves closely by ties of government and discipline and by similarity of rule. The Cassinese congregations of Benedictines, and the Congregation of Cluny are examples.

Congregations; Roman. A Sacred Roman Congregation is a college or corporation consisting of a certain number of Cardinals, for taking charge of, discussing, and deciding matters which belong to certain particular branches of business. The primacy of the Roman Pontiff of its very nature demands that his counsellors and assistants should be selected throughout the world from among those who have personal knowledge and experience of places and persons in cases submitted for examination or judgment.

To this fact councils owe their origin. They did not, however, suffice. The need of a permanent body at the side of the Pope was felt to be opportune. Thus the College of Cardinals arose. When all the Cardinals were convoked in presence of the Pope to deliberate on a particular point or to transact an affair of importance, this Convocation was called a Consistory. From this Consistory of Cardinals the Roman Congregations took their origin.

The chief author of the Sacred Congregations was Sixtus V. He arranged all the ecclesiastical affairs in a certain system and distributed them among fifteen different congregations.

Afterwards Clement VIII., Gregory XV., Urban VIII., Clement IX., and Pius VII., added other congregations. They are divided into Ordinary and Extraordinary ones according as they are permanent or constituted only for a time.

The congregations consist of Cardinals, only one of whom holds the office of Prefect unless the Holy Father reserves that prefecture for himself. As Secretary, usually a titular Archbishop is appointed. In order that the decisions of the Congregations be valid it is necessary that not fewer than three Cardinals make up each Congregation, unless the Pope by a special indult grants that a less number suffice.

The power of each Congregation is limited to the matters assigned to it by the Pope, and the sphere of its jurisdiction extends over the whole Church.

The form of procedure varies according to the nature of the Congregations, the scope of power that is exercised, and the diversity of the cases presented for deliberation or settlement. Routine matters of no great moment and which are extrajudicial may be settled by the Secretary or the Prefect; while serious questions and judicial causes are laid before the whole Congregation and moreover must be brought to the personal attention of the Pope.

The decisions of the Congregations on the questions proposed are usually given in the simplest forms—for example, "Affirmative" or "Negative."

There can be no true appeal from the sentences of the Sacred Congregations as they are the decisions of the highest tribunals. However, a new hearing may be asked and obtained.

The Roman Congregations are the following:

1. The Congregation of the Consistory.

This Congregation is the solemn gathering of the whole college of Cardinals present in the Curia and assembling before the Pope for consultation and definition of certain most important ecclesiastical affairs. The Consistory is of two kinds, Public and Secret.

According to the present discipline only certain solemn acts are now performed in the Public Consistory, such as the giving of the red hat to the new Cardinals after they have been appointed in the Secret Consistory. In the Secret Consistory are made the promotions to the Cardinalate; appointments of bishops and their transfer from one diocese to another; the granting of Palliums; creation, division, and union of diocese; selection of delegates "a latere" and of coadjutor bishops; solemn allocutions about the most important Church matters, and in general consultations about affairs that are of most serious moment.

The Congregation of the Consistory has or-

CONGREGATIONS

dinarily the Pope for its prefect and consists of from eight to twelve Cardinals. Its secretary is the same as that of the Sacred College of Cardinals.

Annexed to this Congregation is the Congregation for the Examination of Bishops which was instituted by Gregory XIV. Its duties, however, to a large extent, are now performed by the Special Congregation for the appointment of archbishops and bishops, which was first instituted by Benedict XIV. and restored by Leo XIII. on 21 Sept. 1878.

2. The Congregation of the Inquisition or the Holy Office. (See INQUISITION.)

3. The Congregation of the Index of Prohibited Books. (See INDEX.)

4. The Congregation of the Council (*Interpretum concilii Tridentini*).

The Council of Trent in its twenty-fifth session solemnly declared its confidence in the efforts of the Roman Pontiff to remove by opportune declarations and remedies any difficulties or doubts arising from its Tridentine Decrees. Hence Pius IV. instituted a congregation of eight Cardinals to look after the execution and observance of the Council's decrees. Pius V. and Sixtus V. enlarged the faculties of the Congregation. Its duties now lie in the interpreting of disciplinary decrees of the Council of Trent and in the taking of measures regarding the observance of these decrees, and finally it has the power of judging in causes which are implicitly or explicitly contained in these decrees. It has a Prefect, a Secretary, an assistant secretary, and an auditor, and several consultors.

Joined to the Congregations of the Council are:

a. The Special Congregation upon the State of Churches.

b. The Special Congregation upon the Revision of Provincial Synods.

c. The Special Congregation upon the Residence of Bishops.

d. The Congregation of Ecclesiastical Jurisdiction and Immunity.

5. The Congregation of Bishops and Regulars.

This Congregation owes its origin chiefly to Sixtus V. Its special duty is to settle affairs which concern bishops and regulars. Hence it has competency in all cases which regard the proper administration of dioceses by their bishops, excepting only those cases which require an interpretation of the Council of Trent. It receives appeals made to the Apostolic See against bishops, etc., replies to difficulties which may arise in the administration of a diocese; examines, approves, or disapproves the alienation of Church property, etc. It settles contentions which arise between different religious orders; examines complaints caused by the election of a superior general or other superiors or by their administration. In a word this Congregation has competency in all that regards the proper rule and direction of religious orders in the Church. It is constituted upon similar lines to the other Congregations, having a Prefect, Secretary, etc. Annexed to it also are two Special Congregations, namely:

a. The Congregation for Discipline of Regulars, established by Innocent XII.

b. The Congregation of the State of Regular Orders.

6. The Congregations of Rites.

Man is obliged to worship God and he expresses this worship by external rites. These rites and ceremonies which the Church makes use of in the administration of the Sacraments, in the divine offices and generally in the worship of God and the veneration of his Saints, form a grand object lesson for the people of God. They exhibit an external expression of the faith.

To see that these rites are diligently observed, to reform and amend, if need be, books on sacred rites and ceremonies, to make, execute, and interpret liturgical laws, and solve the doubts arising in the execution of them, to prepare the causes of beatification and canonization, the Congregation of Rites was instituted. It owes its origin to Sixtus V., being instituted by him by the Constitution of 22 Jan. 1587.

The Congregation is two-fold; the Extraordinary, which occupies itself only with the beatification or canonization of saints; and the ordinary which decides the other questions pertaining to the jurisdiction of the Congregation of Rites.

The number of cardinals assigned to it depends upon the reigning Pontiff. There is the usual Prefect, the Secretary, an ecclesiastic who is called the Promoter of the Faith, and who has also an assistant, a chancellor, and a hymnographer, whose duty it is to arrange and correct the offices of the Saints and other such matters. Besides these there are a number of Consultors taken from the ranks of the secular and regular clergy.

United with this Congregation is the Holy Ceremonial Congregation, which has supervision of the liturgical and non-liturgical ceremonies used in the Papal Court.

7. The Congregation of Indulgences and Relics.

By his Constitution "in Ipsiis" of 6 July 1669, Clement IX. instituted the Sacred Congregation of Indulgences and Relics. He invested the Congregation with the authority to resolve all doubts and difficulties about indulgences and relics and to correct abuses, to prohibit the publication of false or apocryphal indulgences, to authenticate relics recently discovered, and to oversee the granting of indulgences and the distribution of relics.

The Congregation of Indulgences is formed on similar lines to those of other congregations. It has, therefore, a Prefect, a Secretary, and Consultors, etc. It does not grant any indulgences; the Pope does that. All Rescripts or general concessions of indulgences must be shown under pain of nullity to the Secretary of the Congregation. Leo XIII. ordered an authentic publication of all its decrees from the year 1668 to the year 1882. The work was brought out by Fr. Pustet and Co. and has been declared authentic.

8. The Congregation for the Propagation of the Faith (*Propaganda Fidei*).

The first vestige of the Propaganda is found in a Commission instituted by Gregory XIII. for the purpose of keeping the Catholics of the Greek Rite in the faith and of bringing back schismatics to the unity of the Church. After being perfected by Clement VIII. it was finally erected as it is now constituted by Gregory XIV. on 22 June 1622. Of all the Congregations, the Propaganda for English-speaking countries is the

CONGRESS

most interesting because the dioceses of these countries at the present time are subject to it. All the business which the faithful of missionary countries, clergy and laity, may have with the Holy See is done through the Propaganda.

In these countries it has exclusive jurisdiction and holds the place of all the other congregations. Missionary countries, in the language of the Church, are such as have no episcopal sees and whose ecclesiastical affairs are administered by delegates and vicars of the Pope. These vicars apostolic are usually bishops and are called titular bishops from the fact that they derive their title from some ancient see which no longer exists. But even after episcopal sees and dioceses are canonically erected in these missionary lands with bishops having ordinary jurisdiction, the Propaganda frequently retains the government of them. This is the case in the United States, England, Ireland, Scotland, Australia, Canada, Holland, and some other countries.

The power of the Propaganda is legislative, judicial, and gubernative. Hence it can make laws, decide controversies, and rule over the countries in which it has jurisdiction. The resolutions and general decrees impose upon its subjects the obligation of obedience and are not merely the expression of a probable opinion, as was once asserted.

The Congregation is presided over by a Cardinal who is called Prefect-General. There is also one who is called Prefect of Economy. One of the other officials is a Protonotary Apostolic whose duty it is to collect the acts of martyrs who have sacrificed their lives in missionary countries. Almost every week the ordinary meeting is held, while the general assembly takes place usually once a month.

The principal work of the Propaganda is the spreading of the Catholic faith throughout the world. Consequently it has sent and still sends out many missionaries to preach the Gospel. To prepare young men for their missionary labors Urban VIII. instituted the "College of the Propaganda" which is attached to the Palace of the Congregation. Connected with the Congregation of the Propaganda are:

a. The Congregation for the Affairs of the Oriental Rites.

b. The Congregation for the Correction of Books of the Oriental Rite.

c. The Examination of the New Constitutions of Religious Orders depending on the Propaganda.

d. The Commission for the Examination of the Reports of the Bishops and Vicars Apostolic under the Jurisdiction of the Propaganda.

e. The Commission for the Reunion of Dissenting Churches.

9. The Congregation of Studies.

It was begun by Sixtus V. and instituted by Leo XII. In the bull of Sixtus V. the four famous universities of Paris, Oxford, Bologna, and Salamanca are mentioned. Leo XIII. enlarged the powers of the Congregation and extended its authority over all the Catholic universities of the world.

Its power lies in the erection, constitution, and administration of the Catholic universities for which, having consulted the Pope, it lays down standards concerning the professors, methods, academical decrees, etc.; solves doubts about

rights, privileges and suits or disputes arising between the different universities regarding the degrees or privileges. By a Catholic University is meant one which confers degrees by apostolic authority. Those erected in recent years are the universities of Lille, Paris, Lyon, Angers, Fribourg, Ottawa, Laval, and Washington.

Annexed to the Congregations of Studies is the Commission for Historical Studies.

10. The Congregation for the Fabric of Saint Peter's.

The building of St. Peter's Basilica in Rome was undertaken by Julius II. in 1506. It took years to complete it and a large outlay of money was required in its building and afterwards in its preservation. To administer its affairs Clement VIII. in 1593 erected a special Congregation for the Fabric of Saint Peter's.

The Cardinal Archpriest of the Basilica is its Prefect. The scope and office of the Congregation, inasmuch as it is of practical moment to the Universal Church has regard to donations for pious causes and to certain questions about obligations of saying Masses; for example, the transferring of them from one Church to another or from one altar to another; the extension of time for the saying of them; their reduction in number, etc.

Besides the foregoing Congregations, the Sovereign Pontiff may at any time establish others or diminish the number of those already existing. Thus in 1895 Leo XIII. established a commission for the work of fostering the reconciliation of non-Catholics with the Church.

Consult: Ferraris, 'Congregationes'; 'Decrees of the Council of Trent'; Wernz, 'Jus Decretalium' (Vol. II., Rome 1899); Baart, 'The Roman Court' (Fr. Pustet, New York); Humphrey, 'Urbs et Orbis, or the Pope as Bishop and as Pontiff' (London 1899).

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Congress (Lat. "coming together," "meeting"), a meeting of rulers or representatives of several states, to adjust disputes between different governments. It is necessary to distinguish the meeting in which preliminaries are settled, from the principal congress, which is to bring the affair in question to a decision. The plenipotentiaries when they meet, after mutual greetings, appoint, in a preliminary conference, the day on which the congress is to be opened, and determine the manner in which business is to be transacted, the forms of negotiation, the order of precedence among the different powers, and the time of session. The congress opens by the exchange and perusal of credentials among the plenipotentiaries, which, in case the negotiating parties have referred to the arbitration of a mediator, are given to him. The envoys of the contending powers then carry on their negotiations directly with each other, or by the intervention of a mediator, either in a common hall or in their own residences by turns, or, if there is a mediator, in his residence. These negotiations are continued either by writing or by verbal communication, until the commissioners agree upon a treaty, or until one of the powers dissolves the congress by recalling its minister. Such meetings of the representatives of different countries are sometimes called conferences. The nominal difference between a conference and a

CONGRESS

congress is this, that the representatives of the different countries at the former are the ordinary ambassadors of the respective countries at the court at which the conference is held, while the representatives at the latter are specially deputed for the purpose. Among congresses of the 19th century the chief are the Congress of Vienna, 1815; of Paris 1856; and of Berlin 1878.

Congress, Continental. The first recognition of a solidarity of interests among the English colonies in America, and attempt at joint action against a common foe, was in 1690, by Jacob Leisler, the revolutionary dictator of New York; and this perception was stimulated by the fact that New York bore the first brunt of Canadian invasion, and needed help. He invited the other colonies to send delegates to New York and contribute men and money for a counter-invasion; but none farther south than Maryland responded. A much more comprehensive plan was devised by Franklin in 1754 (see ALBANY CONGRESS), but fell through. In 1765, on occasion of the Stamp Act (q.v.), a colonial congress from all the North except New Hampshire, and only South Carolina of the South below Maryland, met at New York 7-25 October; but took no action except to petition Parliament. In 1773, when the Revolution was impending, Franklin renewed his former suggestion in a letter to the assembly of Massachusetts, whose agent in London he was; but still nothing was done.

The next year, however, on receiving news of the Boston Port Bill, Virginia proposed to the other colonies a Continental Congress in the fullest sense; that is, including Canada, for it was not doubted that this recently subjugated province would gladly join in a revolt against its conqueror. Massachusetts responded 7 June, others followed, and the first real American Congress met in Philadelphia, 5 Sept. 1774, sitting till 26 October. Canada, however, was not represented; nor was Georgia, though it shared in all succeeding Congresses. The instructions to the delegates did not contemplate separation or forcible resistance, but only the proposal of measures to "restore harmony" with Great Britain; and the Congress merely drafted addresses to the king and the people of that country, to the Canadians, and to their own constituents, and recommended non-importation and non-exportation agreements, and the forcible resistance to any forcible attempt to carry out the Parliament's taxation measures. It also advised the immediate election of delegates to a fresh Congress in Philadelphia 10 May 1775; which was carried out by various bodies—legislative assemblies in some cases, popular conventions or committees of safety (q.v.) in others. None of these had any legal power to act for this purpose, and the title of all alike was the will of the *force majeure* of the people; for the loyalist section had equal right to oppose the elections, and it was tacit acceptance of superior fighting force that gave the title. The fact that this Congress was considered necessary at all, and was to have power to organize combined resistance to Great Britain, would be conclusive evidence that the leaders of public opinion had determined on independence unless highly improbable concessions were made, were it not for the extreme reluctance the Congress displayed in declaring it, only doing so under irresistible urgency from public opinion; and had

we not the memory of the hopes of accommodation and conciliation by Union leaders not only in 1860-1, but all through the War. The now frequent charge of hypocrisy against the Revolutionary leaders involves one against all the patriotic statesmen of the decade before 1860.

As soon as war was actually proclaimed by Great Britain the second Congress assumed the fullest powers of sovereignty; much greater than those of the British Parliament, for it combined the powers of that body with those of the king, being itself both executive and legislative head of the nation. It raised military and naval forces and directed belligerent operations with them, authorized privateering, contracted treaty alliances, issued national currency, etc., in both capacities. This was by no usurped power, but by the urgency of the people, who were far more anxious to have it take the powers than it was to exercise them. The provincial congresses appealed to it for authorization, and the people urged it to more energetic action. Its crowning act was the Declaration of Independence; its business from 12 July to 20 August the debating of the scheme of government it had drafted (see CONFEDERATION, ARTICLES OF), but which was not put in force for five years, and for which it was perhaps slight misfortune to have waited. It sat till 12 Dec. 1776.

The session of 20 Dec. 1776 has been hesitantly called the third Continental Congress; for the delegates were selected entirely by the State legislatures, and the body as a whole had a title more definite and regular, though not in reality more legal. But in fact, the second Congress, from the opening on 10 May 1775, was a continuing body in perpetual session; with no definite term of sitting or terms of membership; the State legislatures which had selected members did not specifically send new ones for the new session, but each chose them for such terms as it pleased—Congress exercising no right of control in this matter—and recalled them at will. Each State had but one vote, being thus equal, as in the Senate, where each has two; but in the Senate the members have individual votes. This provision in the Continental Congress was avowedly made only because a census could not then be taken to ascertain the relative populations. As under the Confederation, the Congress dealt with States, not individuals; and much of the impotence with which it is reproached in the Revolution was involved in this, though not all of its follies are thus excusable. Some of its worst performances, however—as the misdealing with the officers which drove some of them from the service permanently and others temporarily, and deeply injured the cause—were directly due to the tenacious individuality of the States, which claimed their share of the military patronage then as they do of the civil patronage now.

A history of the Congress is a history of the country during its lifetime; but some of its migrations are significant of military reverses and recoveries. From 20 Dec. 1776 to 4 March 1777 it sat at Baltimore; 4 March to 18 Sept. 1777, at Philadelphia; 27 Sept. 1777, at Lancaster, Pa.; 30 Sept. 1777 to 27 June 1778, at York, Pa.; 2 July 1778 to 21 June 1783, at Philadelphia. But before this it had ceased to be the Continental Congress, and become the Congress of the Confederation, on 2 March 1781, after the ratification of the Articles by Maryland. Con-

CONGRESS — CONGRESS OF THE UNITED STATES.

sult: Histories of the United States by Bancroft, Hildreth, Schouler, Von Holst, etc.; Fiske, 'Critical Period of American History' (1888).

Congress, Library of, an institution in Washington, D. C., which, despite its restricted name, is really the National Library of the United States. The Library of Congress was established in 1800, destroyed in 1814 by the burning of the capitol, afterward replenished by the purchase by Congress of the library of ex-President Jefferson, 6,760 volumes (cost, \$23,950); in 1851, 35,000 volumes destroyed by fire; in 1852, partially replenished by an appropriation of \$75,000; increased (1) by regular appropriations by Congress; (2) by deposits under the copyright laws; (3) by gifts and exchanges; (4) by the exchanges of the Smithsonian Institution, the library of which (40,000 volumes) was, in 1866, deposited in the Library of Congress, with the stipulation that future accessions should follow it. Fifty sets of government publications are placed at the service of the Library of Congress for international exchanges through the Smithsonian. Other special accessions have been: the Peter Force collection (22,529 volumes, 37,000 pamphlets), purchased 1867, cost \$100,000; the (Count de) Rochambeau collection (manuscript), purchased 1883, cost \$20,000; the Toner collection (24,484 volumes, numerous pamphlets), gifts in 1882 of Dr. Joseph M. Toner; the Hubbard collection (engravings), gift in 1898 of Mrs. Gardiner G. Hubbard; in 1905, 72 manuscript maps once owned by Richard, first Earl Howe, and 860 letters received by President Van Buren.

The collection in the main library now (1905) comprises 1,344,618 books, 250,000 pamphlets, 26,500 manuscripts, 82,744 maps and charts, 410,352 pieces of sheet music, and 183,724 photographs, prints, engravings, and lithographs. Of the printed books, probably one third are duplicates. The law library of 110,978, volumes (which remains at the capitol) is not included in the above. The main collection is rich in Federal documents, history, political science, jurisprudence, and Americana in general, including important files of American newspapers and original manuscripts (colonial, revolutionary, and formative periods). The exhibition cases on the second floor contain many rare books, including the records of the Virginia Company. The Smithsonian deposit is strong in scientific works, and includes the largest assemblage of the transactions of learned societies which exists in this country.

In 1897 the main collection was removed from the capitol to the Congressional Library Building (q.v.). Congress makes an annual grant for the maintenance of the library. In 1899-1900 the grant was \$25,000 for printing and binding and \$31,680 for books and periodicals.

Congress of Religions, an assemblage of representatives of all the Christian denominations and other religious bodies of the world, held at Chicago during the World's Columbian Exposition of 1893. Among these were Buddhists, Mohammedans, and the followers of other Asiatic religions, and the tenets of the various faiths were expounded in many strange tongues. The greatest harmony prevailed, and the meeting was one of the most interesting events of the great exposition.

Congress of the United States. The discussion of this body falls naturally into three parts: (1) the constitutional mandates concerning it; (2) its own rules and usages; (3) its practical functions as developed by historical evolution.

1. By the first article of the Constitution, the legislative power of the country, so far as granted at all, is "vested in a Congress of the United States, which shall consist of a Senate and House of Representatives."

The Senate must consist of two senators from each State (thus equalizing the power of the States to safeguard their own interests), elected by the State legislatures for six years; the terms so arranged that one third are vacated every two years, making it a continuing body. Each legislature fills any vacancy in its State delegation caused by death or resignation, but if one occurs while it is not in session, the governor of the State may fill it pro tem till the legislature meets. A senator must be 30 years old, 9 years a citizen, and an inhabitant of the State which elects him; but the legal definition of residence is impliedly left to the State. The president of the Senate is the Vice-President of the United States, who has only a casting vote; but in his absence, or on his accession to the presidency, it shall choose a president pro tem. All impeachment trials are its prerogative, to be decided by a two thirds vote; if the President is impeached, the chief justice presides; it can inflict no punishment but removal from and disqualification for office. No treaties are valid without the consent of two thirds of the Senate; nor any appointment to office by the President without the consent of a majority of it, unless Congress takes away this power from the senatorial half of itself, which it is not likely to do.

The House must consist of members chosen for two years by popular election, so that each House is a new body; the voters to be the same who choose the most popular branch of each legislature; each member must be 25 years old, seven years a citizen, and an inhabitant of the State. The number from each State must be graded by population, determined by a decennial national census (in the body of the Constitution, three fifths of the slaves are to be counted in, a provision made obsolete by the Thirteenth Amendment). These representatives must not exceed one to 30,000 inhabitants—which would allow a maximum of about 2,550 at present, in place of the actual 386. In case of vacancy, the State executive is to issue a writ of election to fill it. The House chooses its own speaker. And lastly, it has the sole power of presenting the impeachments which the Senate has the sole power of trying.

The State legislatures were to fix the times, places, and manner of electing members of either House, subject to the right of Congress to change anything but the place of electing senators, which of course is the legislative chamber. But the numerous deadlocks and failures to elect, due to the two branches of the legislature being under different political control, and the minority House refusing to meet the other for an election, led to the law of 2 July 1866, prescribing a uniform rule for all States. Congress is to meet at least once a year; on the first Monday in December unless it orders otherwise. The President can convene a special session on

CONGRESS OF THE UNITED STATES

“extraordinary occasions”); but he cannot adjourn or prorogue it except in case of disagreement between the Houses—a provision suggested, like so many others, by the quarrels of the English Parliaments with the kings. Each House is the judge of the qualifications of its own members. A majority of each constitutes a quorum; but a single member can adjourn from day to day, and can compel the attendance of enough absent members to make a quorum if the House will provide a rule for so doing. Each House makes its own rules of procedure, can punish members for disorderly behavior, and two thirds can expel a member. Each must keep a journal of its proceedings (see *CENSURE, Congressional*, for argument on the implications of this), and publish it, except such part as the House judges best to keep secret. One fifth of the members present at any time may compel a yea and nay vote to be taken on any question, and entered on the journal. Neither House during a session shall adjourn for more than three days or to any other place, without consent of the other. Members of both Houses shall be paid by the nation. They shall be exempt from arrest during the session and in journeys to and from, and from liability for any utterances in debate—a reminiscence of the burning need of such provision in older English history; not often invoked now, and still less often for creditable reasons. No member shall be appointed to any office created or its pay increased during his term—again a souvenir of temporary political squabbles; and no officeholder shall be at the same time a member. Bills for raising revenue must originate in the House (originally a safeguard for the large States, against the small ones using their power in the Senate to throw the financial burdens on their richer neighbors); but the Senate can propose amendments. Bills vetoed by the President must be reconsidered by, and the objections entered in full on the journal of, the House where they originated; and a two thirds vote may pass it to the other House, a two thirds concurrent vote of which makes it a law. (The first Congress, on the question arising, decided this to mean two thirds of those present and voting, not of the whole membership.) Such votes must be yea and nay, and entered on the journals. A bill not returned by the President within 10 days (Sundays excepted) becomes a law *ipso facto*, unless Congress adjourns meanwhile, when it lapses. No order, resolution, or vote of the concurrent Houses is valid without the assent of the President, except one to adjourn.

The powers of Congress are generally those inherent in every sovereign assembly of the people; but there are two important restrictions. The President's veto (above) is a very real restraint on tyranny by a bare majority, perhaps not honestly obtained and always inviting dishonesty with such supreme power; and it retains full vitality, while the English royal veto has perished. Still more important is its confinement by the Constitution to the powers expressly granted: its laws are invalid if pronounced by the supreme court contrary to the Constitution, while a majority vote of the English Parliament could theoretically abolish the monarchy or hang the entire population. Too much is sometimes made of this, however. The “implied powers” of caring for the national wel-

fare have been found in practice elastic enough for every claim of sovereignty. As to the supreme court, it is the creature of an act of Congress and could be abolished by another (as a whole system of national courts actually was); more simply, it can be and has been swamped and packed to reverse an unpopular decision, and if its decisions are defied (as they were under Jackson), it is powerless to enforce them. Hence it is very cautious about deciding “political” issues of burning intensity (see *CHEROKEE CASE*), except in the sense of the majority, or opposing a strong current of popular feeling. In a word, Congress is the ultimate sovereign. Its inhibitions by the Constitution reflect past history and the politics of the time curiously enough. It is not to prohibit the slave-trade before 1808, and not to grant titles of nobility—conversely, no one is to receive office, title, or gift from any foreign potentate without its consent; it is not to suspend the habeas corpus except on account of rebellion or invasion, not to pass bills of attainder, not to lay export taxes, nor direct taxes except in proportion to population, not to give preferential duties between the States, or enforce clearances at ports outside a vessel's destined State. Not all of these things were needless fetters; and certainly the prohibition from drawing money except on regular appropriations, and the injunction to publish the disposition of the money drawn, was not one.

There being at present 45 States, the number of senators is 90. The number of representatives has never been determined by the Constitutional provision, whose minimum was fixed when the country had but 2,500,000 or so of inhabitants. A maximum of desirable numbers has been fixed, and this has been slowly enlarged from the reluctance at each census to reduce the actual number of representatives in Congress from any given State; hence each has retained all it had, but the States with increased population have been given more members. In January 1901, on the basis of the census of 1900, Congress fixed the number at 386, to take effect 3 March 1903. The State membership was as follows: Arkansas, 7; California, 8; Colorado, 3; Connecticut, 5; Delaware, 1; Florida, 3; Georgia, 11; Idaho, 1; Illinois, 25; Indiana, 13; Iowa, 11; Kansas, 8; Kentucky, 11; Louisiana, 7; Maine, 4; Maryland, 6; Massachusetts, 14; Michigan, 12; Minnesota, 9; Mississippi, 8; Missouri, 16; Montana, 1; Nebraska, 6; Nevada, 1; New Hampshire, 2; New Jersey, 10; New York, 37; North Carolina, 10; North Dakota, 2; Ohio, 21; Oregon, 2; Pennsylvania, 32; Rhode Island, 2; South Carolina, 7; South Dakota, 2; Tennessee, 10; Texas, 16; Utah, 1; Vermont, 2; Virginia, 10; Washington, 2; West Virginia, 5; Wisconsin, 11; Wyoming, 1.

2. Each house has its own system of rules for business (78 in the Senate, 45 in the House), with vital differences. The most far-reaching is the previous question in the House and the absence of it in the Senate. The reasons for the difference are obvious: the great number of representatives, and the fact that most bills are first introduced there, would make business not merely difficult but impossible if every one could talk at will to any length; the smaller numbers and lesser business of the Senate enable free debate to be retained. The House restricts speeches to an hour; the Senate has no restriction except that a member cannot speak

CONGRESS OF THE UNITED STATES

over twice a day on the same question. Each system of course has its attendant possibility of evil: the suppression of needful public light on bills in the one case, "filibustering" and holding up of public business by a factious or interested minority in the other. The business of both Houses is done by committees; neither will consider bills or memorials at once on presentation, except on suspension of the rules — which to be sure, during the latest days of a session, lets through vast numbers of undebated, unexamined, and unknown bills. But by rule they must be referred to some standing committee, of which there are now 48 in the House and 32 in the Senate, besides 10 select committees in the House and 12 in the Senate; and three joint standing committees. The functions of these committees are assigned by the rules; but as these lap over, two or three committees often contend vigorously for the possession of some one bill. In the Senate, these bills are presented in open session on the floor; in the House, they are handed to the clerk, indorsed with such reference or disposition as the presenting member wishes made. These committees are appointed in the House by the speaker; in the Senate they are chosen by caucus of the majority party, and elected by a single yea and nay vote, though the rules say by ballot "unless otherwise ordered." In case of difference between the Houses, which continually occurs, they are harmonized by committees of conference, three senators and three representatives. The most steadily powerful of these committees, which can obtain the floor at any time, are those on Appropriations in each House, disbursing the money in the treasury, and on Privileges and Elections, deciding the right of every member to his seat; next to these, on revenue (Ways and Means in the House, Finance in the Senate), with enormous power to help or harm the great businesses of the country — many think too much — and on Printing, which of course is an immediate matter. Next in actual favor come, perhaps, those on Rivers and Harbors and on Pensions, branches of that on Appropriations which they involve; and when new States are to be admitted, on Territories. In formal dignity the Senate committees on Foreign Affairs, on the Judiciary, and on Military and Naval Affairs, take high rank; so in the House do those on Rules, Foreign Affairs, Judiciary, Military Affairs, and Naval Affairs; and of course special circumstances at any time may temporarily make any one of these, or almost any other committee, the centre of interest to which everything else must give way. In some respects most important of all except the Appropriations Committee are the special conference committees, which do an immense share of the actual legislation of the country: they compromise conflicting business and political interests, include or exclude bills, decide on appropriations, etc., and being usually appointed in the crowded closing days of a session, generally have their recommendations heeded.

3. The changes in congressional functions and relations, from the intent of the framers of the Constitution, come under three heads: (1) the position of Congress as a whole regarding the executive; (2) the position of the two Houses regarding each other; (3) the position of the whole body regarding legislation.

(1) The Constitution attempted a total separation and absolute equality between the executive and legislative branches, the latter deciding on measures of public welfare and the former carrying them out. How far this would be desirable if perfectly accomplished — altogether forbidding one branch of the government to think and the other to act — might be questioned, but will not be argued here. At any rate, it was never remotely realized except when both were in deadly need of the same thing, or one was content to forego thinking. The ideal example of its best is probably the Lincoln administration, a strong executive and a strong Congress with the same essential purposes; of its worst, the Johnson administration, where the thoughts of the one and the acts of the other were at irreconcilable variance, and what the one most wished done was what the other was most set on not doing. More usually, one side or the other has been master. The extreme instance of executive mastery was the Jackson administration, where a resolute and aggressive leader, with a not too reflective popular majority behind him, got such legislation as he wished; of congressional mastery, each reader may prefer to choose his own instance. But there can be no question that the balance inclines more and more decisively to the congressional side. Of late years the results of attempted executive independence have been more picturesque than successful. The Senate, which has the confirmation of treaties and appointments, cannot be prevented from signifying in some form what treaties and appointments it will confirm; and the body which can grant or refuse money for public purposes can decide what those purposes shall be.

(2) The change of power between the Houses is not so dramatically obvious, but it is quite as notorious, and is easily explicable. The Senate has some superiorities: its long terms both attract superior men on an average, and enable them to acquire parliamentary knowledge and public weight; its committees are still its servants rather than its masters — preparing legislation for it to discuss, rather than merely killing most of it, and leaving the rest to run in an undiscussed huddle through the open sluice at the last; and it has time and rules that permit some genuine argument, for its own and the public's enlightenment. But these very terms render seats so valuable and desirable that members are more loath to peril them than House seats; and the Senate, which was expected to have more independence than the House from the length of terms, has actually of late years had less backbone and less willingness to run counter to popular currents within its own party than the House. Moreover, the license of debate has too often been a mere license of wanton obstruction, bringing forward no new facts or illuminating discussion, but only exhibiting the spectacle of the will of 80,000,000 people nullified by one or two of its servants. This does not contradict, but only supplements, the other evil. On the other hand, the unity and despatch of public business made possible in the House by the nominal autocracy and real leadership of the speaker, aided by the committees and the previous question, have made it seem more and more the body where something is accomplished, and the will of the people carried into execution.

CONGRESS OF THE UNITED STATES

(3) The drift of our form of government, and the coming position of Congress and its organs within it, are to some extent matters of prophecy rather than fact; and political philosophers have been busy with them. But some things are certain, and though commonplace, must be recited. Chief of them are the control of the speaker and the committees over legislation. That the speaker is a totally different officer from the English speaker is obvious. He puts motions, decides question of rule and order, and represses disorder, it is true; but instead of being a sworn judge he is a recognized party chief, with functions which approximate the English premier much more closely than the other. By his appointment of the committees he determines the line which legislation shall take, and in a broad way the bills which shall or shall not be considered; and by his daily power of recognizing members who wish the floor, in which he is held to none but party responsibility, he still further molds the total impression which the measures shall make on the public. But he is no autocrat; his very influence can only be exercised by appointing the chief party leaders to the committees, and once there, it is they and not he who hold the decisive power; he and they together, in fact, form something like the shaping committee which is what the English Cabinet, headed by the premier, has fully become. The Cabinet officers, moreover, are fast becoming advisers of the committees rather than of the President: he does not need their advice in knowing how to act, nearly as much as the committees need it in knowing what to think. These approximations to the English position have caused many to think that the transformation will be fully carried out, and the parliamentary system established in fact if not in form in the future; the speaker having the full power of the premier, and the President becoming a dignified nullity like the sovereign of England. But there are still some vital differences, and it is not easy to foresee the process by which they will be overcome. It is true that the admission of Cabinet officers to the floor of either House, to expound their views and needs and explain doubtful questions, is within a simple permissive vote of that House at any time, and can perfectly well be made a standing rule; and that the consequent necessity of their being skilful speakers and capable expositors would profoundly modify the character of men chosen for that position. But the committee do not want information on the floor of the House of Representatives at least: they have no time to attend to it there, and the rules would mostly shut it off before anything material had been communicated. They want it in their committee rooms, and that needs no change in the men and would involve none before the public. The officers cannot become primarily public speakers and secondarily executive officers unless the House gives up its time to debate; and the whole tendency is the other way, nor is it evident where the new time would be found or taken. The place where the change would have to take place is in the Senate if at all; but the power of legislation more and more drifts away from the Senate except as concurrent; and the new debaters, if they arrive, will seemingly be more in the position of those in the House of Lords than of Commons, which would be imma-

terial. Still greater is the obstacle of fixed terms. The English members of the Commons remain no longer when the people vote that they do not want them, and it is consequently the great party object to obtain such a vote, and to put the other party in a position where they must be disgraced if they do not ask the people to give one pro or con. But the American member must serve out his term, and he can do so if his party has lost all public favor: the tremendous sweep of 1874 did not shorten any Republican member's term for a day, nor imperil any piece of Republican legislation, for which they had an entire session after they were voted down, and as many special ones as the President had chosen to call; and similarly with reverses of the other side. This alone prevents debate from taking up time in the House; it is mainly a sham battle, the real one having been fought in committee. Still further, the English committee called the Cabinet is all of one party, represents it, goes down with it; and the bills it puts forward are the party's bills. But the American committees, though with a party majority, include both parties, and the measures they bring in are not specifically or nominally the party's programme; still less are the bills which are hammered into shape by the conference committees, representing neither one party nor one House. The American Cabinet of speaker and committees cannot be held to such corporate responsibility, and there is no prospect of their so being held.

SESSIONS OF CONGRESS.

- I. 1st session, 4 March to 29 Sept. 1789; 2d session, 4 Jan. to 12 Aug. 1790; 3d session, 6 Dec. 1790 to 3 March 1791.
- II. 1st session, 24 Oct. 1791 to 8 May 1792; 2d session, 5 Nov. 1792 to 2 March 1793.
- III. 1st session, 2 Dec. 1793 to 9 June 1794; 2d session, 3 Nov. 1794 to 3 March 1795.
- IV. 1st session, 7 Dec. 1795 to 1 June 1796; 2d session, 5 Dec. 1796 to 3 March 1797.
- V. 1st session, 15 May to 10 July 1796; 2d session, 13 Nov. 1797 to 16 July 1798; 3d session, 3 Dec. 1798 to 3 March 1799.
- VI. 1st session, 2 Dec. 1799 to 14 May 1800; 2d session, 17 Nov. 1800 to 3 March 1801.
- VII. 1st session, 7 Dec. 1801 to 3 May 1802; 2d session, 6 Dec. 1802 to 3 March 1803.
- VIII. 1st session, 17 Oct. 1803 to 27 March 1804; 2d session, 5 Nov. 1804 to 3 March 1805.
- IX. 1st session, 2 Dec. 1805 to 21 April 1806; 2d session, 1 Dec. 1806 to 3 March 1807.
- X. 1st session, 26 Oct. 1807 to 25 April 1808; 2d session, 7 Nov. 1808 to 3 March 1809.
- XI. 1st session, 22 May to 28 June 1809; 2d session, 27 Nov. 1809 to 1 May 1810; 3d session, 3 Dec. 1810 to 3 March 1811.
- XII. 1st session, 4 Nov. 1811 to 6 July 1812; 2d session, 2 Nov. 1812 to 3 March 1813.
- XIII. 1st session, 24 May to 2 Aug. 1813; 2d session, 6 Dec. 1813 to 18 April 1814; 3d session, 19 Sept. 1814 to 3 March 1815.
- XIV. 1st session, 4 Dec. 1815 to 30 April 1816; 2d session, 2 Dec. 1816 to 3 March 1817.
- XV. 1st session, 1 Dec. 1817 to 30 April 1818; 2d session, 16 Nov. 1818 to 3 March 1819.
- XVI. 1st session, 6 Dec. 1819 to 15 May 1820; 2d session, 13 Nov. 1820 to 3 March 1821.
- XVII. 1st session, 3 Dec. 1821 to 8 May 1822; 2d session, 2 Dec. 1822 to 3 March 1823.

CONGRESS OF THE UNITED STATES

XVIII. 1st session, 1 Dec. 1823 to 27 May 1824; 2d session, 6 Dec. 1824 to 3 March 1825.
 XIX. 1st session, 5 Dec. 1825 to 22 May 1826; 2d session, 4 Dec. 1826 to 3 March 1827.
 XX. 1st session, 3 Dec. 1827 to 26 May 1828; 2d session, 1 Dec. 1828 to 3 March 1829.
 XXI. 1st session, 7 Dec. 1829 to 31 May 1830; 2d session, 6 Dec. 1830 to 3 March 1831.
 XXII. 1st session, 5 Dec. 1831 to 16 July 1832; 2d session, 3 Dec. 1832 to 3 March 1833.
 XXIII. 1st session, 2 Dec. 1833 to 30 June 1834; 2d session, 1 Dec. 1834 to 3 March 1835.
 XXIV. 1st session, 7 Dec. 1835 to 4 July 1836; 2d session, 5 Dec. 1836 to 3 March 1837.
 XXV. 1st session, 4 Sept. to 16 Oct. 1837; 2d session, 4 Dec. 1837 to 9 July 1838; 3d session, 3 Dec. 1838 to 3 March 1839.
 XXVI. 1st session, 2 Dec. 1839 to 21 July 1840; 2d session, 7 Dec. 1840 to 3 March 1841.
 XXVII. 1st session, 31 May to 13 Sept. 1841; 2d session, 6 Dec. 1841 to 31 Aug. 1842; 3d session, 5 Dec. 1842 to 3 March 1843.
 XXVIII. 1st session, 4 Dec. 1843 to 17 June 1844; 2d session, 2 Dec. 1844 to 3 March 1845.
 XXIX. 1st session, 1 Dec. 1845 to 10 Aug. 1846; 2d session, 7 Dec. 1846 to 3 March 1847.
 XXX. 1st session, 6 Dec. 1847 to 14 Aug. 1848; 2d session, 4 Dec. 1848 to 3 March 1849.
 XXXI. 1st session, 3 Dec. 1849 to 30 Sept. 1850; 2d session, 2 Dec. 1850 to 3 March 1851.
 XXXII. 1st session, 1 Dec. 1851 to 31 Aug. 1852; 2d session, 6 Dec. 1852 to 3 March 1853.
 XXXIII. 1st session, 5 Dec. 1853 to 7 Aug. 1854; 2d session, 4 Dec. 1854 to 3 March 1855.
 XXXIV. 1st session, 3 Dec. 1854 to 18 Aug. 1855; 2d session, 21-30 Aug. 1856; 3d session, 1 Dec. 1856 to 3 March 1857.
 XXXV. 1st session, 7 Dec. 1857 to 1 June 1858; 2d session, 6 Dec. 1858 to 3 March 1859.
 XXXVI. 1st session, 5 Dec. 1859 to 18 June 1860; 2d session, 3 Dec. 1860 to 3 March 1861.
 XXXVII. 1st session, 4 July to 6 Aug. 1861; 2d session, 2 Dec. 1861 to 17 July 1862; 3d session, 1 Dec. 1862 to 3 March 1863.
 XXXVIII. 1st session, 7 Dec. 1863 to 2 July 1864; 2d session, 5 Dec. 1864 to 3 March 1865.
 XXXIX. 1st session, 4 Dec. 1865 to 28 July 1866; 2d session, 3 Dec. 1866 to 3 March 1867.
 XL. 1st session, 4-29 March, 3-20 July, 21 Nov. to 2 Dec. 1867; 2d session, 2 Dec. 1867 to 27 July, 21 Sept. 16 Oct. and 10 Nov. 1868; 3d session, 7 Dec. 1868 to 3 March 1869.
 XLI. 1st session, 4 March to 10 April 1869; 2d session, 6 Dec. 1869 to 15 July 1870; 3d session, 5 Dec. 1870 to 3 March 1871.
 XLII. 1st session, 4 March to 20 April 1871; 2d session, 4 Dec. 1871 to 10 June 1872; 3d session, 2 Dec. 1872 to 3 Dec. 1873.
 XLIII. 1st session, 1 Dec. 1873 to 23 June 1874; 2d session, 7 Dec. 1874 to 3 March 1875.
 XLIV. 1st session, 6 Dec. 1875 to 15 Aug. 1876; 2d session, 4 Dec. 1876 to 3 March 1877.
 XLV. 1st session, 15 Oct. to 3 Dec. 1877; 2d session, 3 Dec. 1877 to 20 June 1878; 3d session, 2 Dec. 1878 to 3 March 1879.
 XLVI. 1st session, 18 March to 1 July 1879; 2d session, 1 Dec. 1879 to 16 June 1880; 3d session, 6 Dec. 1880 to 3 March 1881.
 XLVII. Special session of the Senate, 10-29 Oct. 1881; 1st session, 5 Dec. 1881 to 8 Aug. 1882; 2d session 4 Dec. 1882 to 3 March 1883.
 XLVIII. 1st session, 3 Dec. 1883 to 7 July 1884; 2d session, 1 Dec. 1884 to 3 March 1885.
 XLIX. 1st session, 7 Dec. 1885 to 5 Aug. 1886; 2d session, 6 Dec. 1886 to 3 March 1887.

L. 1st session, 5 Dec. 1887 to 20 Oct. 1888; 2d session, 3 Dec. 1888 to 4 March 1889.
 LI. 1st session, 2 Dec. 1889 to 1 Oct. 1890; 2d session, 1 Dec. 1890 to 3 March 1891.
 LII. 1st session, 7 Dec. 1891 to 5 Aug. 1892; 2d session, 5 Dec. 1892 to 3 March 1893.
 LIII. Special session of the Senate, 4 March to 15 April 1893; 1st session 7 Aug. to 3 Nov. 1893; 2d session, 4 Dec. 1893 to 28 Aug. 1894; 3d session, 3 Dec. 1894 to 4 March 1895.
 LIV. 1st session, 2 Dec. 1895 to 11 June 1896; 2d session, 7 Dec. 1896 to 3 March 1897.
 LV. 1st session, 15 March to 24 July 1897; 2d session, 6 Dec. 1897 to 8 July 1898; 3d session, 5 Dec. 1898 to 4 March 1899.
 LVI. 1st session, 4 Dec. 1899 to 7 June 1900; 2d session, 3 Dec. 1900 to 4 March 1901.
 LVII. 1st session, 2 Dec. 1901 to 1 July 1902; 2d session, 1 Dec. 1902 to 4 March 1903.
 LVIII. Special session of the Senate, 5 to 16 March 1903; 1st session, 9 Nov. 1903 to 7 Dec. 1903; 2d session, 7 Dec. 1903 to 28 April 1904; 3d session, 5 Dec. 1904 to 4 March 1905. Special Session 6-18 March 1905.
 LVIX. 1st session 4 Dec. 1905 to 30 June 1906; 2d session 3 Dec. 1906.

PRESIDENTS PRO TEM. OF THE SENATE.

Years	Name	State
1789-1792	John Langdon.....	N. H.
1792	Richard H. Lee.....	Va.
1792-1794	John Langdon.....	N. H.
1794-1795	Ralph Izard.....	S. C.
1795-1796	Henry Tazewell.....	Va.
1796-1797	Samuel Livermore.....	N. H.
1797	William Bingham.....	Pa.
1797	William Bradford.....	R. I.
1797-1798	Jacob Read.....	S. C.
1798	Theo. Sedgwick.....	Mass.
1798-1799	John Laurence.....	N. Y.
1799	James Ross.....	Pa.
1799-1800	Samuel Livermore.....	N. H.
1800	Uriah Tracy.....	Conn.
1800-1801	John E. Howard.....	Md.
1801	James Hillhouse.....	Conn.
1801-1802	Abraham Baldwin.....	Ga.
1802-1803	Stephen R. Bradley.....	Vt.
1803-1804	John Brown.....	Ky.
1804-1805	Jesse Franklin.....	N. C.
1805	Joseph Anderson.....	Tenn.
1805-1808	Samuel Smith.....	Md.
1808-1809	Stephen R. Bradley.....	Vt.
1809	John Milledge.....	Ga.
1809-1810	Andrew Gregg.....	Pa.
1810-1811	John Gaillard.....	S. C.
1811-1812	John Pope.....	Ky.
1812-1813	Wm. H. Crawford.....	Ga.
1813-1814	Jos. B. Varnum.....	Mass.
1814-1818	John Gaillard.....	S. C.
1818-1819	James Barbour.....	Va.
1820-1826	John Gaillard.....	S. C.
1826-1828	Nathaniel Macon.....	N. C.
1828-1832	Samuel Smith.....	Md.
1832	L. W. Tazewell.....	Va.
1832-1834	Hugh L. White.....	Tenn.
1834-1835	Geo. Poindexter.....	Miss.
1835-1836	John Tyler.....	Va.
1836-1841	William R. King.....	Ala.
1841-1842	Samuel L. Southard.....	N. J.
1842-1846	W. P. Mangum.....	N. C.
1846-1849	D. R. Atchison.....	Mo.
1850-1852	William R. King.....	Ala.
1852-1854	D. R. Atchison.....	Mo.
1854-1857	Jesse D. Bright.....	Ind.
1857	James M. Mason.....	Va.
1857-1861	Benj. Fitzpatrick.....	Ala.
1861-1864	Solomon Foot.....	Vt.
1864-1865	Daniel Clark.....	N. H.
1865-1867	Lafayette S. Foster.....	Conn.
1867-1869	Benjamin F. Wade.....	Ohio.
1869-1873	Henry B. Anthony.....	R. I.
1873-1875	M. H. Carpenter.....	Wis.
1875-1879	Thomas W. Ferry.....	Mich.
1879-1881	A. G. Thurman.....	Ohio.
1881	Thomas F. Bayard.....	Del.
1881-1883	David Davis.....	Ill.
1883-1885	Geo. F. Edmunds.....	Vt.
1885-1887	John Sherman.....	Ohio.
1887-1891	John J. Ingalls.....	Kan.
1891-1893	C. F. Manderson.....	Neb.
1893-1895	Isham G. Harris.....	Tenn.
1895-	William P. Frye.....	Me.

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SPEAKERS OF THE HOUSE OF REPRESENTATIVES.

Years	Name	Party	State
1789-1791	F. A. Muhlenburg....	Dem.	Pa.
1791-1793	Jonathan Trumbull...	Fed.	Conn.
1793-1795	F. A. Muhlenburg...	Dem.	Pa.
1795-1799	Jonathan Dayton.....	Fed.	N. J.
1799-1801	Theodore Sedgwick...	Fed.	Mass.
1801-1807	Nathaniel Macon.....	Dem.	N. C.
1807-1811	Joseph B. Varnum....	Dem.	Mass.
1811-1814	Henry Clay.....	Dem.	Ky.
1814-1815	Langdon Cheves.....	Dem.	S. C.
1815-1820	Henry Clay.....	Dem.	Ky.
1820-1821	John W. Taylor.....	Dem.	N. Y.
1821-1823	Philip P. Barbour....	Dem.	Va.
1823-1825	Henry Clay.....	Dem.	Ky.
1825-1827	John W. Taylor.....	Dem.	N. Y.
1827-1834	Andrew Stevenson...	Dem.	Va.
1834-1835	John Bell.....	Whig	Tenn.
1835-1839	James K. Polk.....	Dem.	Tenn.
1839-1841	R. M. T. Hunter....	Whig	Va.
1841-1843	John White.....	Whig	Ky.
1843-1845	John W. Jones.....	Dem.	Va.
1845-1847	John W. Davis.....	Dem.	Ind.
1847-1849	Robert C. Winthrop..	Whig	Mass.
1849-1851	Howell Cobb.....	Dem.	Ga.
1851-1855	Linn Boyd.....	Dem.	Ky.
1855-1857	Nathaniel P. Banks..	Rep.	Mass.
1857-1859	James L. Orr.....	Dem.	S. C.
1859-1861	Wm. Pennington....	Rep.	N. J.
1861-1863	Galusha A. Grow....	Rep.	Pa.
1863-1869	Schuyler Colfax.....	Rep.	Ind.
1869-1875	James G. Blaine....	Rep.	Me.
1875-1876	Michael C. Kerr.....	Dem.	Ind.
1876-1881	Samuel J. Randall...	Dem.	Pa.
1881-1883	John W. Keifer.....	Rep.	Ohio.
1883-1889	John G. Carlisle....	Dem.	Ky.
1889-1891	Thomas B. Reed.....	Rep.	Me.
1891-1895	Charles F. Crisp....	Dem.	Ga.
1895-1899	Thomas B. Reed.....	Rep.	Me.
1899-1903	David B. Henderson.	Rep.	Ia.
1903-	Joseph G. Cannon....	Rep.	Ill.

F. M. COCKRELL,

Late United States Senator from Missouri.

Congressional Library Building, the home of the library of the United States Congress, opened in 1897 and authorized by acts of Congress of 15 April 1886; 2 Oct. 1888, and 2 March 1889, at a cost of \$6,347,000 (limit by law), \$6,500,000) exclusive of the land, which cost \$585,000. The building occupies three and three quarter acres upon a site 10 acres in extent at a distance 1,270 feet east of the capitol, and is the largest and most magnificent library building in the world. In the decorations, some 40 painters and sculptors are represented, all American citizens. The floor space is 326,195 square feet, or nearly eight acres. The book stacks contain about 45 miles of shelving, affording space for 2,200,000 volumes. Were the long corridors, now used in part for exhibition purposes, completely shelved, the building would accommodate over 4,000,000 volumes. The library contains a reading room for the blind, open daily. The library is maintained by annual appropriations by Congress for various purposes. For the year 1899-1900 this amounted to \$213,452 for services (including the copyright department, and including, also, the care of the building); and \$26,500 for fuel, supplies, miscellaneous purposes, including contingent expenses.

Congressional Record, a journal of the proceedings of the Congress of the United States, dating from 1799. Prior to that date the Senate held secret sessions only, but thereafter publication was required, save in the case of "executive sessions." 'Record' has been the title since 1875; before that date the journal was entitled 'Annals of Congress' (1789-99 for the House, and 1799-1824 for both branches), 'Register of Debates' until 1837, and through 1874 'Congressional Globe.' Undelivered speeches on the grant of "per-

mission to print" appear in the 'Record' as if they had actually been given, and stenographic reports of debates are revised by the participants before being printed.

Congressman at Large, a national representative elected by the entire State and not as a member for some district. There is no permanent system of the sort, though many able political thinkers have wished for it, and believed it would greatly raise the average of ability in the House; preventing the restriction of choice to the mediocre notabilities who chance to reside in a given district. In fact, however, there is no legal obstacle now to the voters of a district electing an outsider if they wish; but they rarely wish it, and if the general system were introduced, the experience of other political affairs makes it probable that the memberships would be "claimed" by given districts in rotation. At present, the only use of the plan is in giving a State the fresh memberships assigned to it by the apportionment under a new census, until it can be redistricted, which is sometimes a long process with fierce political opposition. Many States have had one congressman at large, and some two.

Congreve, kōn'grēv, **Richard**, English essayist: b. Leamington, Eng., 4 Sept. 1818; d. Hampstead, Eng., 5 July 1899. He was educated at Rugby and Oxford and was subsequently a tutor in Wadham College, Oxford, resigning his post on becoming a Positivist. Beside editing Aristotle's 'Politics' with notes (1855); he published 'The Catechism of Positivist Religion' (1858); 'Elizabeth of England' (1862); 'Essays: Political, Social, and Religious' (1874).

Congreve, **William**, English dramatist: b. Bardsey, near Leeds, 1670; d. London 19 Jan. 1729. He entered the Middle Temple, London, to prepare himself for the legal profession, but soon deserted the law for literature. At a very early age he wrote a novel entitled 'Incognita,' followed by his comedy of the 'Old Bachelor,' produced in 1693, and pronounced by Dryden the greatest first play that he had ever beheld. His next play, the 'Double Dealer' (1693), was not so successful in representation; but his third, the comedy of 'Love for Love' (1695), proved extremely popular. Its success acquired for the author the patronage of Lord Halifax, who conferred on him several very lucrative posts, so that he was far more prosperous than most men of letters. Not content with his fame in comedy, he essayed tragedy; and in 1697 produced his 'Mourning Bride,' the reception of which was extremely favorable. The composition of four such plays before he had attained the age of 28 is a remarkable proof of early genius in a line of composition demanding great observation and experience. The license of his writings caused him to be attacked by Jeremy Collier in his 'Short View of the Immorality and Profaneness of the English Stage,' to which Congreve published a lame and ineffective reply. He soon after closed his dramatic career with the 'Way of the World' (1700), considered by many critics as the most perfect of his comedies, but which was received so coldly that he resentfully determined to relinquish a species of writing in which, upon the whole, he had been eminently successful. A masque, entitled the 'Judgment of Paris,' and 'Semele,' an opera, the



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CONGREVE — CONIC SECTIONS

latter of which was never presented, close the list of his labors for the stage. He, however, continued to write occasional verses on public subjects; and in 1710 published a collection of his plays and poems. Dryden declared him to be the equal of Shakespeare. Steele dedicated to him his 'Miscellanies,' and Pope his translation of the Iliad. He was buried in Westminster Abbey, where a monument was erected to him by the Duchess of Marlborough. Congreve's comedies are chiefly distinguished for the sustained flow of wit in the dialogue. But his characters are repulsive. It is now rare for any of his plays to appear on the stage, which without pruning, to adapt them to modern manners, it would be impossible for them to do. His poetry is of little value. Consult Macaulay, 'Comic Dramatists of the Restoration'; Hazlitt, 'Lectures on the English Comic Writers'; Gosse, 'Life of Congreve' (1888).

Congreve, Sir William, English inventor: b. 20 May 1772; d. Toulouse, France, 16 May 1828. After passing through the Royal Academy at Woolwich he entered the artillery in 1791, served under his father, a lieutenant-general, and in 1814 succeeded him in his post of comptroller, and also as second holder of the baronetcy, conferred in 1812. He invented the rocket which bears his name about 1804. It was first used in active service in the attack on Boulogne, 1806, and on Copenhagen 1807. He took an active part in army improvements; became a Fellow of the Royal Society in 1811; obtained a patent for manufacturing gunpowder in 1815; and one for the manufacture of bank-note paper in 1819.

Con'gruism, Congruist, terms derived from the expression *meritum e congruo*, which signifies the view of some writers on the doctrine of divine grace and human merit, that though a man may not in the strict sense merit a given grace or favor of God he may be said to merit in a looser sense, on the ground that there is a certain congruity, a certain fitness with what we believe concerning the relation between man and his Creator, in assuming that the Creator will out of his infinite mercy grant to his faithful servants favors that they do not in any tolerable sense of the word merit. An example of *meritum e congruo* is had when a saintly man by his prayers obtains the conversion of a sinner: that conversion is not merited at all in any strict sense: but it is congruous, it is what we like to think about the Creator's love for his chosen ones, that he should be moved to grant the petition of one who is admitted to his friendship.

Conhydrin, kōn-hī'drīn, a substance contained, along with conia, in the flowers and seeds of the hemlock. The physiological action of conhydrin resembles that of conia, but it is not nearly so rapid or powerful. See CONIA.

Coni, kō'nē, or **Cuneo**, koo-nā'ō, a town of Italy, capital of the province and district of Coni, on a high hill, at the confluence of the Stura and the Gesso, about 50 miles south of Turin, in a pleasant, well-cultivated district. The old fortifications, the arcades along the principal street, a Franciscan church of the 12th century, a handsome town-house, with a tall tower, and a cathedral, are the picturesque items of the town. There are silk spinning-mills, and manufactures of silk and woolen goods. Grain,

hemp, and silk form articles of commerce. It was taken by Napoleon in 1796, by the Austrians in 1799, and again given up to the French in 1801. Pop. (1901) 27,065.

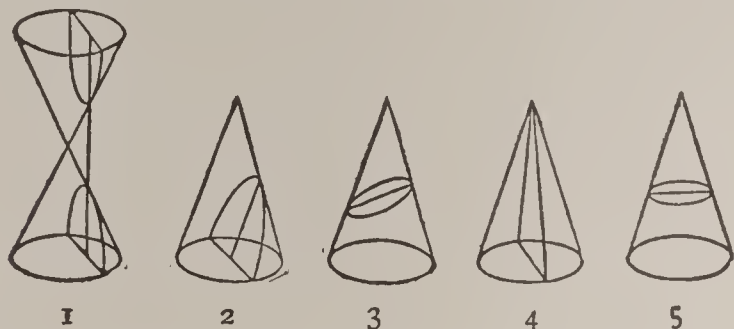
Conia, or **Coniine** (C₅H₁₇N), an alkaloid in the hemlock, discovered in an impure state by Giesecke in 1827, and subsequently prepared in the pure state by Geiger, who recognized it as a vegetable base. It exists, combined with malic acid, in all parts of the plant, but especially in the not quite ripe seed. When pure it is a colorless oily liquid, specific gravity 0.89, which changes by exposure to air to a brown fluid, and ultimately to a resinous, bitter mass, slightly soluble in water, soluble in alcohol, and when purified yielding a jelly with a butyric odor. It can be distilled without much alteration, provided the air be excluded, its boiling-point being 168° C. At a higher temperature it burns with a bright smoky flame. It is slightly volatile even at ordinary temperatures. It has a very disagreeable odor, sharp and choking when strong; its taste is nauseous. It is somewhat soluble in water, readily in alcohol, ether, and oils, and itself acts as a solvent of sulphur. It has a strong alkaline reaction when moist, and combines with the acids to form salts, most of which are crystalline but deliquescent. The salts are unstable in aqueous solution; they evolve the odor of the base and gradually change color. It precipitates the oxides of iron, zinc, manganese, aluminum, copper, and the other heavy metals, from solutions of their salts. It is attacked by chlorine, bromine, and iodine, and oxidized by nitric acid, yielding butyric acid. The poisonous action of conia has been minutely investigated, but although it has been proved to be rapidly fatal to all classes of animals when administered in doses of from 3 or 4 to 10 or 12 grains, the nature of its action is not fully ascertained; but the breathing and pulse are affected, and the extremities paralyzed. Some experimenters have tried its effect upon themselves, and according to their account the minutest doses produce burning in the mouth, salivation, nausea, and vomiting, pressure in the head, tottering, indistinct vision, cramps, and other symptoms. Similar observations have been made on persons to whom the alkaloid has been given therapeutically. It has been shown that conia can be detected in a poisoned animal, even after a considerable time. The tonic power of conia seems to be little if at all affected by the introduction into it of the alcoholic radicals, methyl, and ethyl. The action is perhaps not so rapid, but it is the same in character, and takes place with quite as small quantities. In this respect conia differs from some other alkaloids, for instance, codeia.

Conibo, kō-nē'bō, a tribe of Indians in eastern Peru, allied to the Ucayali tribe. They were an agricultural people and built villages. The Spanish missionaries tried to convert them in 1683, but were driven out after 1695, when Father Ritchie was killed by the savages. They are now partially civilized and are often employed as canoe men and rubber gatherers.

Conic Sections, three curves, the hyperbola, the parabola, and the ellipse, are called the conic sections, because these curves are formed by the intersection of the surface of a cone with planes that cut the cone in various directions. If the cutting-plane be parallel to the axis of the cone (fig. 1), the curve formed is

CONIFERÆ

the hyperbola, which has two branches, as shown in the figure. If the cutting-plane be parallel to a straight line on the surface of the cone (fig. 2), the curve formed is a parabola. Any other section is an ellipse (fig. 3). It must be noticed, however, that this general description includes three peculiar cases. In the case of a plane parallel to the axis of the cone, when that plane contains the axis, the section, instead of being a hyperbola,



is in this limiting case a pair of straight lines meeting each other at an angle equal to that of the angle of the cone so as to form a triangle (fig. 4). When a plane, which would otherwise form a parabolic section, is a tangent plane to the cone, the parabola degenerates into a straight line passing through the vertex of the cone. Lastly, when a plane that would otherwise form an ellipse is perpendicular to the axis of the cone, the ellipse becomes a circle (fig. 5). The properties of these curves are discussed under their several names. It will there be seen that other definitions may be given of the curves; and that from these their properties are more conveniently derived than from the consideration that they are formed by the sections of a conical surface. The properties of these curves are of the greatest physical interest; and the geometry of the conic sections has, ever since the time of the Greek mathematicians, been considered as the best of the more advanced geometrical studies.

Coniferæ, kō-nīf'e-rē, a natural order of trees and shrubs consisting of about 40 genera and 300 species, which are most numerous in the temperate regions of the world, especially in the northern hemisphere. Among the few species found in the tropics, the most important are those belonging to the genera *Araucaria* (q.v.), *Dammara*, *Phyllocladus*, and *Dacrydium*. In the Arctic region and the correspondingly cold mountain climates various conifers approach very nearly the line of perpetual snow, and like other plants of such climates are reduced to gnarly dwarfed specimens which bear but slight resemblance to those of the same species in less rigorous climates. In the United States and Canada 15 genera and about 100 species and sub-species are indigenous and of these the majority are native to the Pacific coast. In addition to the number of species mentioned fully 400 horticultural varieties must be added. These are listed in Bulletin No. 17 of the Division of Forestry, U. S. Dept. of Agriculture.

No forest trees are of more economic importance than the conifers. Their notable blending of maximum strength, stiffness and durability with minimum weight, and their abundance have won them prominence in house, ship, and bridge building, wharf making and sidewalk constructing, etc. They are also of great importance in planting, both for use and ornament, their evergreen habit (except in Ginkgo

and *Larix*) and the retention of their lower limbs until comparative age, making them especially good for wind breaks; and these characters coupled with their conical form and the striking colors of their foliage rendering them particularly useful for grouping with deciduous trees and shrubs or for individual specimens in parks and upon lawns.

The species are characterized by straight shafts which elongate terminally, and like the shape of the trees, form a more or less attenuated cone, the species of which have broad leaves. They have either needle-shaped or awl-shaped leaves (except in *Podocarous*) which are specially adapted by these forms and by the thickened epidermis to resist excessive transpiration, a necessary adaptation since the leaves are usually retained throughout the year. They have naked ovules which are fertilized directly by the exceedingly light pollen which is produced in enormous quantities and carried by the wind even miles away from the forests, to fall as so-called "showers of sulphur." These ovules are borne in a "strobilus" which enlarges after fertilization into what is popularly known as the cone, the order being named from this character. The cone is an aggregation of scales, above the bases of which are borne the seeds. These are in some species utilized as food, and have been introduced in the markets of the United States by the Syrians. The internal structure of the *Coniferæ* is also peculiar to the group. Like the dicotyledons, the woody cylinder increases in girth by the external development, beneath the bark, of homogeneous woody fibres marked on two sides with circular disks and among which are few true vessels. Since these woody fibres are fitted together without overlapping, the grain of the wood is fine and uniform, which accounts for its easy working qualities, especially in the direction of the "grain."

Botanists divide the species into two great sub-orders, the *Taxaceæ* and *Pinaceæ*. The former includes two tribes, *Podocarpeæ*, the leading genus of which is *Podocarpus*, with about 40 species, and *Taxeæ*, which consists of the genus *Taxus*, the yew. The species of this sub-order have more or less fleshy fruits. The *Pinaceæ* embraces four tribes: *Abietineæ*, the pine family proper, of which the principal genera are: *Pinus*, pine; *Picea*, spruce; *Tsuga*, hemlock; *Abies*, fir; and *Larix*, larch; *Taxodieæ* which includes *Taxodium*, the bald cypress; and *Sequoia*, the redwood; *Cupressineæ*, which includes *Thuja*, arborvitæ; and *Juniperus*; juniper; *Chamæcypris*, cedar; *Araucariæ*, including *Araucaria*, Norfolk Island pine and its allies. (See separate articles upon the various groups, under their popular name titles, except *Araucaria* and *Sequoia* (qq.v.). The most widely distributed of these groups are undoubtedly the genera *Pinus* and *Juniperus*, and the most restricted are *Taxodium*, two species of which are indigenous to the United States and one to China; and *Sequoia*, of which only two species are known, both found in occasional groves on the Pacific Coast. During geological ages these two genera were far more widely distributed.

So far as is known from fossils conifers appeared on the earth in Silurian Time, though they may have appeared earlier. They increased and developed during Devonian Time and the Carboniferous. Unlike the acrogens (ferns,

CONIINE — CONIUM

ground-pines, and horse-tail rushes), the conifers have increased rather than declined since the Carboniferous. Species of the yew were abundant in North America in early Devonian Time. In the Carboniferous the gymnosperms that grew in the great swamps were related to the cycads and yews. True conifers may have grown upon the drier hillsides. The genus *Walchia* began near the close of the Carboniferous, and in Permian Time the conifers included species of *Dadoxylon*, *Pinites*, *Ullmania*, etc.; common Triassic conifers are the genera *Voltzia*, *Baiera*, and *Araucarites*.

Conifers are propagated by means of seeds which may usually be obtained in autumn, though some species open their cones at irregular intervals through the winter and others only when artificial heat such as that of a forest fire is applied. The seed should be planted in a sandy loam, given a light mulch, of pine needles or sphagnum moss, and the seedlings kept free from weeds. They must be kept moist but not wet until they have formed their crown buds, which appear when they are about three months old. If proper methods are practised, transplanting may be done at any time of year, but spring is generally much the best season, since the roots are then most active and the check to growth is then least. As a rule conifers do best upon light soils. They are attacked by a large number of insects and diseases both in foliage and trunk, but since these trees and shrubs are planted mainly for ornament or are growing in the forest where systematic war cannot often be successfully carried on, little attention has been given to the control of these pests. Standard fungicides and insecticides may be used effectively in some cases, care being taken to determine the mode of attack of the particular pest.

Consult: Veitch, 'Manual of Conifers'; Beissner, 'Handbuch der Nadelholzkunde'; Carrière, 'Traité des Conifères'; Bailey, 'Cyclopedia of American Horticulture.'

Coni'ine, kō-nī'in, **Coneine**, **Conia**, or **Conine**, a volatile alkaloid having the formula $C_8H_{17}N$, and constituting the active poisonous principle of the hemlock, *Conium maculatum*. It exists in all parts of the plant, but especially in the not quite ripe seeds. When pure it is a colorless oily liquid with a strong, mouse-like odor, oxidizing, upon exposure to air, to a brown fluid, and ultimately to a resinous mass. It boils at $336^\circ F.$, and, at ordinary temperatures has a specific gravity of about 0.86. It absorbs about 25 or 30 per cent of its own weight of water, and freely mixes with alcohol, benzene, chloroform, and ether. It also dissolves sulphur, though it does not dissolve phosphorus. Coniine is a violent poison, causing death by paralysis of the motor nerves.

Con'ingsby, a novel by Benjamin Disraeli, Lord Beaconsfield, published 1844. It was his sixth and most successful novel. In three months it had gone through three editions, and 50,000 copies had been sold in England and the United States. It was a novel with a purpose; the author himself explained that his aim was to elevate the tone of public life, to ascertain the true character of political parties, and especially to vindicate the claims of the Tories. Incidentally he wished to emphasize the importance of the Church in the development of Eng-

land, and he tried to do some justice to the Jews. There are more than threescore characters in the book, and part of its popularity came from people's interest in identifying them with men and women prominent in English social and political life.

Co'nington, John, English classical scholar: b. Boston, Lincolnshire, 10 Aug. 1825; d. there 23 Aug. 1869. He was educated at Beverley, Rugby, and Oxford, and in 1854 was appointed to the newly founded chair of Latin language and literature at Oxford, which he filled until his death. His greatest work is his edition of 'Virgil' (3 vols. 1861-8), with its singularly subtle and suggestive essays. His edition of the 'Agamemnon' (1848), and 'Choephoroi' (1857), of Æschylus are of less moment, though indeed the latter is admirable. In his last years he gave himself much to translation, the results of which were his metrical version of the 'Odes' of Horace (1863), the 'Æneid' (1866), in Scott's ballad-metre, the 'Iliad' (1868), in the Spenserian stanza, and the 'Satires and Epistles' of Horace (1869), in the couplet of Pope.

Coniston (kōn'is-tōn) **Lake**, England, a lake in north Lancashire at the eastern foot of the Coniston Fells, nine miles west of Bowness on Windermere. It is five miles long, one half mile broad, 147 feet above the sea, and its greatest depth is 260 feet. Its waters abound with trout and perch. On the eastern shore stand Ruskin's home, Brantwood, and Tent House, once Tennyson's residence. The Old Man of Coniston, to the northwest, is 2,633 feet high.

Co'nium ("spotted hemlock"), the full-grown fruit of *Conium maculatum* gathered while green. *Conium maculatum* is a stout, erect biennial, three to six feet high, with a much branching, smooth, furrowed, dark green hollow stem, covered with purplish spots, very widely present throughout Europe and introduced into the United States in ballast. It grows commonly in wet places, wayside brooks, swamps, and dark, moist gardens. All parts of the spotted hemlock are active, but the poisonous principle coniine is found most abundantly in the full-grown but unripe seed, the principle being a volatile alkaloid. Only fresh hemlock is of any service, and much of the lack of uniformity of results in the use of this drug as a remedy has come from the neglect of this precaution on the part of the manufacturers of the drug. The composition of conium is complex. It contains a slight amount of volatile oil and two or three alkaloids, the most important of which is coniine. Coniine is present in small amounts only. It is strongly basic, colorless, oily liquid, with a penetrating odor and a sharp taste resembling tobacco. It boils at $166^\circ C.$; its chemical formula is $C_8H_{17}NH, CH_2CH_2CH_3$. It has been made synthetically, being one of the first of the alkaloids thus synthesized. The physiological action of conium is practically identical with the action of coniine. The general effect is paralysis of the motor end organs of voluntary muscles; it is thus a motor depressant. It is an irritant to the stomach, increasing the salivary secretions. Its effect on the heart is slight; its effect on the nervous system is very little save in extreme poisoning, when blood changes cause changes in the nervous system. The early symptoms of poisoning

CONJEVERAM—CONJURING

are heaviness of the muscles of the legs, and of the eyelids, ptosis, staggering gait, muscular relaxation and muscular paralysis; paralysis of the vocal chords causing derangement of speech, dilatation of the pupil and finally paralysis of the muscles of respiration with asphyxia, convulsions, and death. Treatment of the poisoning is by means of the stomach-pump, strychnine, coffee. Alcohol and rapid elimination by hot baths are desirous.

The therapeutics of conium is restricted. It is very questionable whether it is of use in any affection other than habitual motor spasms of voluntary origin such as spasmodic tics, torticollis, and other like affections. It is certainly of very little value in spasmodic affections not associated with voluntary action such as chorea, epilepsy, myoclonus, etc.

Conjeveram, kōn-jē-vēr-ūm', **Canchipura** ("the Golden City"), a town of Hindustan, in the presidency of Madras, district of Chinglepat. It stands in a valley, is irregularly built, and from five to six miles long, resembling a series of villages, intermingled with gardens and coconut plantations. Conjeveram is one of the Hindu sacred cities, and is sometimes called the "Benares of the south." There are here two splendid pagodas; one dedicated to Vishnu, richly sculptured, and highly venerated; the other, a larger and more imposing structure, dedicated to Siva, from the summit of which a magnificent view is obtained. There are many smaller pagodas; and houses of accommodation for travelers abound. Cottons are manufactured. There is a flourishing school here connected with the Free Church of Scotland. Pop. 43,000.

Conjugal Rights, in law, the right which husband and wife have to each other's society, comfort, and affection. The suit for restitution of conjugal rights is a matrimonial suit, cognizable in the divorce court, which may be brought whenever either the husband or wife lives separate from the other without any sufficient reason.

Conjugate Focus. See LENS.

Conjuga'tion. In some unicellular plants and in one-celled animals (*Protozoa*), after multiplying by self-division perhaps for many generations, reproduction by germs is brought about by a process called conjugation. It may be illustrated by a flagellate monad (*Heteromita*). In this form two individuals come together and completely fuse, the result is a thin-walled sac (the zygote), the protoplasm of which divides by multiple fission into very minute spores or germs. Each of these spores finally grows to become an adult *Heteromita*. In a much more specialized protozoan (*Paramacium*), after self-division has been repeated for a certain number of generations, it is interrupted by conjugation. In this case two individuals become applied by their ventral faces, but do not fuse, but the nuclei melt together, so that the fusion of the two individuals takes place, after which the two original infusorians separate. This process is akin to and anticipates sexual reproduction in animals higher than protozoa. The process seems to lend new life to the species; it is a process of rejuvenescence, and is necessary for the maintenance of the life and vigor of the species.

Conjunction, in astronomy, one of the aspects of the planets. Two heavenly bodies are in conjunction when they have the same longitude—that is, when the same perpendicular to the ecliptic passes through both. If they have, at the same time, the same latitude—that is, if they are both equally far north or south of the ecliptic—they appear from the earth to be in the same spot of the heavens, and to cover one another. The sun and moon are in conjunction at the period of new moon. In the case of the inferior planets Mercury and Venus, the conjunction is inferior when the planet is between the earth and the sun, and superior when the sun is between the earth and the planet. In general, a heavenly body is in conjunction with the sun when it is on the same side of the earth, and in a line with the sun, and it is in opposition to the sun when it is on the opposite side of the earth, the earth being in a line between it and the sun. Planets are invisible when in conjunction with the sun, except in rare cases when an inferior planet passes over the sun's disk, and may be seen as a speck on his surface. Conjunctions are either geocentric or heliocentric, according as they are actually witnessed from the earth, or as they would be witnessed if observed from the sun. In observing a conjunction from the earth's surface it is usual to reduce the observation to what it would be if made from the earth's centre; by this means the exact times of conjunction are more accurately fixed, and the observations of one astronomer made available to every other, wherever he may be on the earth's surface. Grand conjunctions occur when several stars or planets are found together. Chinese history records one in the reign of the Emperor Tehuen-hiu (2514-2436 B.C.), which astronomers calculate actually took place.

Conjunction, that grammatical part of speech which couples words, clauses, and propositions. Conjunctions differ from prepositions in their mode of affecting the cases of the nouns which they connect with the previous word or phrase. The preposition is said to govern the noun, that is, to determine its case; the conjunction also determines the case of the noun, but in a different manner; it always requires the case of the noun or pronoun which follows it to be the same as that of the noun with which it connects the second noun. The conjunction also affects actively the modes of verbs, though less frequently in English than in other languages.

Conjunctiva, kōn-jūnk-tī'va, the mucous membrane which lines the inner surface of the eyelids and is continued over the forepart of the globe of the eye. See EYE.

Conjunctivitis. See EYE, DISEASES OF.

Conjuration, in law, an unlawful compact formed by oath, a term formerly used, especially in the sense of having personal conference with the devil or some evil spirit to discover secrets or effect some malicious purpose.

Conjuring, the production of effects apparently miraculous by natural means. The earlier professors of the art claimed *bona fide* supernatural powers; and in ages when the most elementary principles of physical science were unknown beyond a very limited circle, it was not difficult to gain credence for such a preten-

CONKLIN — CONNAUGHT

sion. The modern conjurer makes no such claim, but tells the public frankly that his marvels are illusory. Of the conjurers of remote antiquity we have few reliable records; though it is a tolerably safe conjecture that the prestige of the ancient mysteries rested in no small degree upon effects of natural magic. Perhaps the earliest really trustworthy authority is Reginald Scot, who in his 'Discoverie of Witchcraft' (1584) has enumerated the stock feats of the conjurers of his day.

The conjurers of Scot's time, and even of much later date, were accustomed, in order to facilitate the substitutions on which a great part of their tricks depended, to wear an apron with pockets, known (from its resemblance to a game-bag) as the *gibeciere*. A later school suppressed this tell-tale article of costume, and used instead a table, with cover reaching nearly or quite to the ground. This table concealed an assistant, who worked most of the required transformations, etc., either handing the needful articles to the conjurer as he passed behind the table, or pushing them up through traps in the table-top. Conus the elder, a French conjurer who flourished at the close of the 18th century, made a further improvement by discarding the concealed assistant, and using an undraped table with a secret shelf (now known as the *servante*) behind it, on which his substitutions were made. His immediate competitors did not follow his example, a whole generation of later conjurers, including Comte, Bosco, and Philippe, retaining the suggestive draped table. Its death-blow, however, was struck by Robert Houdin (1805-71), with whom about 1844 a new era began. The most modern school of conjurers, following the lead of Wiljalba Frikell, etc., represented by Hartz, Herrmann, Bua-tier de Kolta, Verbeck, Lynn, Bertram, etc., generally aim at producing their magical results with the minimum of visible apparatus.

Conk'lin, Edwin Grant, b. 24 Nov. 1863. Graduated Ohio Wesleyan University (S.B. 1885, A.B. 1886, A.M. 1889), Johns Hopkins University (Ph.D. 1891). Investigator Marine Biological Laboratory 1890-1901; Professor of Biology Ohio Wesleyan University 1891-1894; Professor of Zoology Northwestern University 1894-1896; Professor of Zoology University of Pennsylvania 1896—. Trustee Marine Biological Laboratory; Member American Society of Zoologists, American Society of Naturalists, Fellow of American Association for the Advancement of Science, Vice President Academy of Natural Sciences of Philadelphia, Secretary of American Philosophical Society, Past President American Morphological Society; Associate Editor of Biological Bulletin and of the Journal of Morphology. Author of 32 scientific papers published between the years 1891 and 1902 among which the following are the most important: 'Fertilization of the Ovum'; 'The Embryology of Crepidula'; 'Syllabus of Six Lectures on Organic Evolution'; 'Evolution and Revelation'; 'The Phenomena and Mechanism of Inheritance'; 'Factors of Evolution'.

Conk'lin, Jennie Maria (DRINKWATER), American author: b. Portland, Maine, 14 April 1841; d. New Vernon, N. J., 28 April 1900. She was educated in the public schools, and while still in her teens won fame with her stories for children. In 1880 she married Rev. Nathaniel

Conklin. Her works include: 'Miss Prudence'; 'Tessa Wadsworth's Discipline'; and 'Fifteen.' She originated the "Shut-In Society," an organization of invalids for correspondence.

Conklin, Viola A., American historical writer: b. New York 15 Nov. 1849. She has published 'American Political History to the Death of Lincoln' (1901).

Conkling, Alfred Ronald, American lawyer: b. New York 28 Sept. 1850. He graduated at Yale 1870; was geologist in the United States Engineer Corps 1875-7; admitted to the New York bar 1879. He has been active in republican municipal politics, and was a member of the New York board of aldermen 1887-8, and of the State legislature 1892-5. In the Greater New York election of 1897 he was a prominent member of the Citizens' Union Party. He has written much for the New York *Tribune*, *Evening Post*, and *Herald*, and has published: 'Guide to Mexico' (1884); 'Letters of Roscoe Conkling' (1889); 'City Government in the United States' (1894); 'Hand-book for Voters' (1894). While a member of the Engineer Corps, he prepared several valuable reports (1875-7).

Conkling, Roscoe, American legislator: b. Albany, N. Y., 30 Oct. 1829; d. New York 18 April 1888. He removed to Utica in 1846, studied law and was admitted to the bar in 1850. He was mayor of Utica in 1858, and sat in Congress as a Republican 1858-62, and 1864-6. During the Civil War he was an active supporter of the administration, appearing constantly in debates and on committees. He was elected to the United States Senate in 1867, 1873, and 1879, and as senator he supported the reconstruction policy, actively opposed President Johnson and was a staunch supporter of President Grant. He became an extremely influential member of his party; in 1876 receiving 93 votes for the presidential nomination, and in 1880, by his support of Grant and his personal opposition to Blaine, dividing the Republicans into two sections. In May 1881, he and his colleague, Thomas C. Platt, suddenly resigned from the Senate, owing to a dispute with President Garfield on a question of patronage, and sought re-election; but after a warm canvass, both were rejected, though vigorously supported by Vice-President Arthur. Conkling afterward practised law in New York. He was appointed associate chief justice of the United States supreme court in 1882, but declined the position.

Conn, Herbert William, American biologist: b. Fitchburg, Mass., 10 Jan. 1859. He was educated at Boston University and is professor of biology at Wesleyan University, Middletown, Conn. He has published 'Evolution of To-day' (1886); 'The Living World' (1891); 'The Story of Germ Life' (1897); 'The Story of the Living Machine' (1899); 'The Method of Evolution' (1900); 'Agricultural Bacteriology.'

Conn, Lough, lōh kōn, a lake in the north of Mayo County, Ireland, united with Lough Cullin by a narrow channel. The two extend for about 13 miles and are studded with islands.

Connaught, kōn'nât, Arthur William Patrick, DUKE OF, English prince, third son of Queen Victoria: b. Buckingham Palace, 1 May 1850. Besides his position of Duke of Connaught, he is Prince of the United Kingdom, Duke of Saxony, Earl of Sussex, and Prince of

CONNAUGHT — CONNECTICUT

Coburg and Gotha. He entered the Woolwich Military Academy in 1866, became general of brigade in 1880; was created Duke of Connaught and Strathern, and Earl of Sussex, 26 May 1874; and received a seat in the House of Lords 8 June of that year. He married Princess Louise Margaret of Prussia, 13 March 1879. In January 1900 he succeeded Lord Roberts as commander-in-chief in Ireland, becoming commander of the Third Army corps in 1901.

Connaught, Ireland, one of the four provinces, bounded east and northeast by Leinster and Ulster, south by Munster, and north and west by the Atlantic; length, north to south, 112 miles; breadth, 99 miles; area, 6,867 square miles. Its west coast is much broken up by numerous bays and inlets, and is thickly studded with islands. The surface is rugged and mountainous, except in the central part, which is comparatively level. It is, on the whole, the least fertile of all the provinces. Connaught was formerly one of the Irish kingdoms. Its kings were of the race of O'Connor, but they were almost exterminated at Athenry in 1305. In 1590 the English divided it into six counties, one of which, county Clare, was afterward transferred to Munster. Pop. (1901) 649,635.

Conneaut, kōn ne ât', Ohio, a town of Ashtabula County, situated at the mouth of Conneaut Creek, on the Lake Shore & M. S., the New York, C., & St. L., and the Pittsburg, S., & L. E. R.R.'s. It is a coal and ore port of importance, and also exports the agricultural produce. It has railroad shops and other manufacturing interests. Pop. (1900) 7,133.

Connecticut, kōn-nēt'-i-kūt, "the Nutmeg State," "the Land of Steady Habits," or "the Constitutional State" (having framed the first written constitution in America), is the southwesternmost of the six New England States. It is bounded by Massachusetts on the north, Long Island Sound on the south, Rhode Island on the east, and New York on the west. Capital, Hartford. Area, 4,845 square miles land, 145 square miles water. Pop. (1900) 908,420.

There is no doubt that the claim of the Dutch to Connecticut by right of discovery was well founded, for the accounts of the voyages of Henry Hudson in 1609 and of Adrian Bloch in 1614 give the first descriptions which history records of this region. The attempts of the Dutch to maintain their foothold by this right were few and ineffectual, failing to prevent William Holmes of Plymouth colony from establishing a trading post at or near Hartford in 1633.

Settlement.—The first permanent settlement by the English was made in 1636, though a disastrous attempt had been made in the previous year by a party from Massachusetts to occupy the three original towns. In June 1636 Rev. Thomas Hooker and Rev. Samuel Stone, with about 100 men, women, and children, made their way from Massachusetts to the Connecticut valley, and there re-established the almost abandoned settlements at the three towns which bore the transplanted Massachusetts names of Newtown, Watertown, and Dorchester, but were, in the following year, respectively named Hartford, Wethersfield, and Windsor. Within a year from the time of this settlement about 30 of the settlers had been wantonly killed by the Pequot Indians, who appeared to be plotting the ex-

termination of the English. In May 1637 Major John Mason, with a band of 90 men, was despatched to attack the Pequots at their stronghold in the present town of Groton. Reaching, by strategic movements, the stockade, where a large number of them were encamped, he took them completely by surprise, killing about 700 by setting fire to their inflammable wigwams and putting to death in hand-to-hand conflict those who escaped the flames. This resulted in the extermination of the Pequot tribe, and secured to the settlers exemption from Indian depredations for all time to come.

The colonists now began to prosper under the leadership of the pastors, Hooker and Stone. Finding themselves outside of the jurisdiction of Massachusetts, to which they at first supposed that they were answerable, they proceeded to form a civil government of their own, adopting in 1639 the Constitution which stands unique in history as the first written constitution of a self-governing people. Its principles had been preached from the pulpit by Thomas Hooker, and its spirit, if not its form, prevailed in the Federal Constitution which was adopted through the influence of Oliver Ellsworth, Roger Sherman, and William Samuel Johnson of Connecticut just 150 years later. By this Constitution of 1639 much less rigid ecclesiastical control prevailed than in Massachusetts Bay and Plymouth colonies, the people were recognized as sovereign, and the authority and even the existence of the ruler of Great Britain was ignored. Meantime there had sprung up in Quinnipiack a budding colony, afterward known as New Haven Colony, under the leadership of Theophilus Eaton and the Rev. John Davenport. This colony in 1639 adopted resolutions which vested the government in seven pillars of the Church, and disfranchised all who were not church members. In 1662 John Winthrop, the younger, then governor of Connecticut, obtained in England from Charles II., a charter which established Connecticut as an independent colony under the constitution already adopted, and defined the boundaries to include New Haven colony, which was thus absorbed, though sorely against its will.

Charter Rights.—From this time onward, for 50 years, Connecticut was engaged in a constant struggle to maintain the rights which the charter had granted. Conflicting grants by Charles II. to his brother, then Duke of York; boundary disputes; conflicts of authority with other colonial governors; and the fear that the charter might be annulled by royal decree, kept the statesmen of the day in an attitude of continual vigilance, and schooled them in diplomacy, tact, and political alertness. But once in her history, and then only for a year and a half, did Connecticut lose that autonomy which she cherished as her birthright. This was during the usurpation of Andros, in 1687. But the charter was preserved, though Andros demanded it. Its preservation was the result of one of the Yankee tricks for which Connecticut has always been famous, and which may have had something to do with giving her the equivocal title of "the Nutmeg State." The charter was brought into the general court toward nightfall at Andros' request. Candles were lighted and, by some mysterious agency, suddenly extinguished. During the darkness which prevailed the charter disappeared. Andros assumed the government,



CONNECTICUT

SCALE OF MILES

- Population of places is indicated by different lettering thus:
- 50,000 and over ——— **HARTFORD**
 - 10,000 to 50,000 ——— **Middletown**
 - 5,000 to 10,000 ——— **Norwalk**
 - 1,000 to 5,000 ——— **East Haven**
 - Smaller Places ——— **Savin Rock**
 - Railroads ———
 - State Capitals ———
 - County Seats ———



CONNECTICUT

and Secretary John Allyn wrote "FINIS" at the close of the record of the proceedings. In May 1689 came the downfall of Andros, and the government and charter reappeared, with the astute Gov. Treat once more in the chair, and an undying reverence established for the old charter oak, where, as tradition tells us, Capt. Joseph Wadsworth hid the precious document when it so suddenly disappeared.

War Services.—From the resumption of the government under the charter to the close of the French war in 1763, Connecticut saw much military service, for which she furnished her full quota, on other soils than her own. The short intervals of peace during this long period did not suffice to regain prosperity, and the year 1763 found the colony impoverished by contributions of men and money in the French and Spanish wars, and confronted with the odious news of the Stamp Act. The enforcement of this measure was prevented by compelling the stamp-master to sign a paper stating that he resigned "of his own free will."

In the War of the Revolution which followed, the share of Connecticut forms a most important feature, still hardly appreciated by historians. The colony was amply, though quietly, prepared in every way for the coming struggle in 1775. Perfect unanimity prevailed. It was unnecessary either to reconstruct the government, as was done in Massachusetts, or to depose the governor, as was done in all the other colonies. Connecticut alone of all the 13 colonies had from the beginning a governor, Jonathan Trumbull, who was an ardent believer in the cause of his country. He became a trusted adviser and helper to Washington. A cherished Connecticut tradition asserts that the national nickname, "Brother Jonathan," is derived from the fact that Washington had used this sobriquet in speaking of Gov. Trumbull. From recent compilations of muster-rolls it is safe to assert that Connecticut furnished 40,000 men in her various enlistments in this war. In the adoption of the Declaration of Independence she was the first colony to instruct her delegates to vote for this measure. During the war, she gained the title of "the Provision State," owing to the unstinted supplies which she sent to the front in all times of need, relieving, for example, the sufferings of the starving soldiers at Valley Forge by sending forward droves of live cattle when Washington wrote Trumbull that the army must disband unless supplies were forthcoming.

As in the French, Spanish, and Indian wars, so in the Revolution, Connecticut's position was, in a certain sense, altruistic, for but little fighting was done on her soil, and it was done at times when her own fighting men were serving their country beyond their own immediate borders. The ravages of two of the most savage massacres and two of the most barbarous raids of the war brought their horror and devastation to this little commonwealth. The Wyoming massacre was an attack on Connecticut settlers on disputed Connecticut soil, justly claimed under grants of the charter, which extended the western boundaries to the "South Sea" or Pacific Ocean, whose location was majestically ignored by Charles II. and his advisers. Wyoming or Westmoreland, now in Pennsylvania, was at the time of the horrible massacre of July 1778 a county of Connecticut, having been previously

a part of Litchfield County, and having been for 25 years settled by a Connecticut company after repeated repulses which only served to strengthen resistance and establish an apparently permanent foothold on the part of the settlers. The refugees, of whom women and children composed a large majority, fled to their homes in Connecticut after the massacre, the terrible results of which did not prevent many of the former inhabitants from returning to Wyoming, and once more establishing themselves in that beautiful region from which they had been so often ruthlessly driven. The other massacre, at Groton, occurred toward the close of the war, 6 Sept. 1781. The raid was commanded by Benedict Arnold, to whom it is unfair to attribute the most disgraceful part of it. He was in New London at the time of the occurrence, his troops having burned a large portion of the town. The little garrison of Fort Griswold at Groton made a brave resistance against forces outnumbering them six to one. When, at last, the British entered the fort, Ledyard, the American commander, presented his sword to the officer in command of the British in token of surrender. This brute, whose name, fortunately for his memory, has never been discovered, received the sword and plunged it at once through Ledyard's heart. This was a token for indiscriminate slaughter, in which hardly a man of this surrendered force was left unhurt, and but few left alive.

The raids of Gov. William Tryon on Danbury in April 1777, and on New Haven, Fairfield, and Norwalk, in July 1779, resulted in great destruction of property by fire and plunder, and in the loss of many lives on both sides. It may be truly said that never but twice did these invaders remain on Connecticut soil over night, and in each case took to their ships the next morning with Connecticut troops in hot pursuit.

Notwithstanding the terrible drain which the Revolution made upon her resources, Connecticut, through her wise financial policy, was better prepared, at the close of the war, to avail of the advantages of peace than were any of the other States with the exception of Delaware. It is hardly surprising that the war of 1812 should have been unpopular in Connecticut as well as in all New England; but too much opprobrium has been heaped on Connecticut by giving the protesting convention for all New England the name of the Hartford Convention for the simple reason that it was held, for convenience, in Hartford. It will be found that Connecticut furnished for this war, too, a goodly number of men, though there were some disputes as to the manner and form of doing it. For the half century following this war, peace and prosperity prevailed, broken only by the comparatively insignificant, but sufficient, contribution which was made to the Mexican war.

The outbreak of the Civil War in 1861, like the outbreak of the Revolution in 1775, found Connecticut with a governor in office who was equal to the emergency. Gov. William A. Buckingham, upon his own responsibility, called for a regiment of volunteers, 16 April 1861, when there was not a regiment of organized militia in the State to meet Lincoln's first call. The private citizens and the towns voted money to forward troops; and soon, instead of one, three regiments of volunteers reported for service, making it necessary for the governor to go to

CONNECTICUT

Washington to have three times the quota accepted under the call. At the close of the war, the official record shows that Connecticut had furnished 54,882 volunteers, which number was largely in excess of her quota.

Industries.—This war stimulated the industries of Connecticut, which had, at the time, reached a high stage of development. The demand which the large and suddenly equipped army and navy of the country made upon these industries could not fail to have this effect. During the 40 years which have followed the War, the development of manufactures has continued to keep up a healthy growth. This little commonwealth, originally composed of intelligent farming communities, has, by a perfectly natural process of evolution, developed into a manufacturing State which, small though it is in area, holds the rank of eleventh in the gross value of its manufactured products, and the rank of second in the per capita value of these products among the 52 States and Territories enumerated in the census of 1900. Still more significant is the fact that a larger number of patents in proportion to the population have been issued to Connecticut inventors than to those of any other State in the Union during the past 10 years.

It appears to be a fact that in early colonial times the same inventive genius which has developed in this little commonwealth was born of necessity, and that it was transmitted by heredity down to the present day. The first settlers brought with them intelligence, broadened views of ecclesiastical control, and little or nothing more. There were no industrial specialists among them; and a century after the towns of the colony had taken root in various parts of the soil the leading townsmen, besides being still farmers with a growing tendency to trade, were each of them equal to any industrial or political emergency which might arise. Diaries covering the first half of the 18th century show, for example, that the diarist was a ship-carpenter, house-carpenter, millwright, surveyor, judge of probate, soldier, and deputy to the general assembly, while pursuing the regular occupation of a trading farmer; and that his neighbors were equally versatile in their industrial and political pursuits. This diversity of individual talents naturally grew, in time, to specializing, as the resources and needs of the commonwealth developed. In 1705 the Granby copper mines were discovered, and unprofitably worked, leaving as souvenirs the Granby copper coins, and the old mine itself, which was used as a prison during the Revolution, and abandoned at the time of establishing the State prison at Wethersfield in 1827. Other attempts at mining for precious metals were equally unsuccessful, but the working of the Salisbury iron mines, which have been in operation since 1730, proved to be a lasting success. From these mines cannons, balls, camp-kettles, and other useful articles were furnished during the Revolution, including the chains which were used to bar the progress of the British fleet on the Hudson. The anchor of the famous ship *Constitution* was forged from Salisbury iron in later days. The ore is a rich hematite, which, prepared by the use of charcoal, yields pig-iron which rivals the famous product of the Swedish and Norwegian mines.

As early as 1749 we find that John Allyn had experimented in brass-making; and in 1768 the first paper-mill of Connecticut, if not the first in the country, was successfully established by Christopher Leffingwell of Norwich. Tin-ware was first made in Berlin in 1770, and furnished for a century or more an important industry in which the Yankee peddler exercised his wit and shrewdness. In 1773 Thomas Harland from London established at Norwich a shop for making and repairing watches and clocks. In this shop Eli Terry learned the mechanism of the timepieces of the day, and afterward applied his inventive genius to the manufacture of pillar-scroll and case clocks, which he perfected in 1793. Other Connecticut inventors, especially Seth Thomas and Chauncey Jerome, have brought clock-making to, or very near, its present advanced stage. Eli Whitney, the inventor of the cotton-gin, though not a Connecticut man by birth, owed his fortune to the successful manufacture of firearms at New Haven in 1798, after having been robbed of his great invention in the South in 1792.

The first manufacture of sewing-machines on an extended scale was established by Elias Howe, at Bridgeport, followed in the same city by the improvements of Wheeler and Wilson. In 1844 Charles Goodyear of New Haven obtained his first patent for the process of vulcanizing india-rubber, a process entirely of his own discovery, which revolutionized this important industry in his day, or rather made a new and still enormously increasing industry in the use of material which, without this invention, would have continued to occupy an unimportant place in the industries of the world. The invention of electro-silver plating is traced to the Rogers Brothers of Hartford. In 1846 these three brothers, Asa H., William, and Simeon S., succeeded, after much experimenting, in finding a successful way of applying this process to articles made of various metals. From small beginnings, the business grew to large proportions, resulting in great establishments in Hartford, Meriden, Waterbury, Norwich, and elsewhere.

The manufacture of textile fabrics had its beginnings in a small woolen factory in Hartford in 1788, and a small cotton-mill in Vernon in 1804, but the growth of this industry to its present proportions did not begin in any marked degree until after the enactment of the joint-stock act in 1837, allowing small sums to be capitalized and small proprietors to join their forces in manufacturing. It may be remarked in passing that this act, forming a long step in the evolution of the modern "trust," was copied by nearly every State in the Union, and by Great Britain. The cotton-mills of the State have found their most available water-power on the Shetucket and Yantic rivers and their tributaries, which form the Thames River at Norwich. Of these mills the Ponemah Company at Taftville has one which, when it was built, was said to be the largest cotton-mill in the world. At Baltic, farther up the Quinebaug River, the large cotton-mill, which had been destroyed by fire, has been rebuilt within a few years. The Willimantic Linen Company is one of the largest thread-producing companies in New England. More than seven tenths of the cotton spindles in the State are operated at Norwich, Thompson, Plainfield, Killingly, and Willimantic. The woolen mills are more widely distributed

CONNECTICUT

throughout the State, at Vernon, Stafford, Broad Brook, New Britain, Norwich, and elsewhere. Among the textile manufactures silk forms an important feature, the industry having had its small beginnings as early as 1732. The silk mill of the Cheney Brothers at South Manchester, established in 1838, and still in active operation, is one of the largest in the country. Connecticut holds its own well in its rank as a textile manufacturing State, having been sixth of all the States in 1900 in the value of its textile products. Of the smaller and more varied manufactures of all kinds, the number, like the aggregate product of the larger ones, has increased largely. The leading industries may be enumerated as brass manufactures, carriage-making, and the manufacture of clocks, corsets, cutlery, electrical apparatus, foundry and machine-shop products, hats, paper, plating, rubber goods, sewing-machines, and textiles.

The most important industry which the State has acquired of late years is that carried on at the large establishment of the Eastern Shipbuilding Company at Groton on New London harbor. Here has just been launched the steel steamship *Minnesota*, soon to be followed by her sister ship, the *Dakota*, of the same model and dimensions. It is claimed for these two ships that, although their length is 70 feet less than that of the great steamship *Cedric*, their excess in other proportions makes them the largest ships in the world. Their length is 630 feet each, width 73½ feet, depth 53 feet, with a displacement of 40,000 tons when loaded to a draft of 40 feet. Their approximate cost is \$2,500,000 each. They are intended for the Pacific and Oriental trade. Among the new and important industrial establishments of the State and of the world is that at Norwich for supplying compressed air as a motive power through long conduits from a central station. After several years of experiment, and a large expenditure of money, this station is now in successful operation as a pioneer in a new and probably vastly important invention.

The amount of capital invested in manufactures in this State in 1900 was \$314,696,736, and the value of the manufactured product was \$352,824,106, showing an increase of 42 per cent over the same values of 10 years before, which is the largest increase since 1870. The number of wage-earners engaged in manufactures was 176,694, or 19½ per cent of the total population. The number of officials, clerks, etc., in the same business was 9,981.

Agriculture.—Although the history of agriculture in Connecticut presents a contrast to the history of manufactures by showing a decline in proportion to the population, agriculture is still second in importance among the industries of the State. In considering this industry it must be remembered that it has for its limits a little commonwealth, being fiftieth in area of the 52 States and Territories enumerated in the census of 1900. In its relation to agriculture, as to physical geography, its area may be rather indefinitely divided into the central lowland, the coast, the eastern upland, and the western upland. Of these the central lowland, lying in the valley of the Connecticut River, is, from Middletown to the northern boundary, best adapted to cultivation; and here it was, that, after spying out the land, the first colonists, whose sole industry was agriculture, settled. From Mid-

dletown to the coast the river leaves the lowland, and cuts a narrow valley through the eastern upland. The portion of the central lowland between Middletown and New Haven is less fertile. Along the lower portions of the coast some market-gardening is carried on, as the cities nearby offer suitable outlets for the products. The eastern upland varies in fertility, but contains some rich farming land. It has also the advantage of a lower average elevation than the western upland, where the only mountains of the State are found. One of these, known as Bear Mountain, reaches an elevation of 2,000 feet or over.

The cultivation of tobacco began in the Connecticut valley, near Hartford, as early as 1680; and the crop of the present day probably reaches a higher value than any other single product of the soil grown in the State. Improved methods of curing the harvested plant have added much to its value of late years. Peach orchards have been quite productive, and after a lapse of many years they again yield an important product. The dairy farms contribute to the central creameries, or are still carried on by individual farmers who can reach a city market. The raising of cattle for food has decreased as an industry.

The amount of capital invested in agriculture is \$113,305,580; and the value of farm products in 1899 was \$28,276,948. The value of domestic animals in 1900 was \$10,247,634. The number of persons engaged in agriculture is reported as 45,596, and the number of farms as 26,948.

Railroads.—The railroads are: the New York, N. H. & H., 4,072 miles; the Central N. E., 233 miles; the New London N. (leased to the Central V. R.R.), 160 miles; and the South Manchester, 5 miles, making a total of 4,470 miles of railroad operated by companies of the State. The latest reported gross earnings of these railroads are:

New York, New Haven & Hartford....	\$43,521,087.11
Central New England.....	593,965.43
New London Northern.....	992,546.67
South Manchester.....	18,049.49
Total	\$45,125,648.70
Total of operating expenses.....	32,627,503.35
Total net earnings.....	\$12,498,145.35

The street railways of the State number, at last reports, 28, and are rapidly extending, two additional charters having been recently granted. The main lines, exclusive of sidings, etc., cover 517½ miles, according to the report of the State railroad commissioners to 30 June 1902. The gross earnings of these companies for the year ending 30 June 1902 were \$3,937,771.46; expenses, \$2,550,236.69; net earnings, \$1,387,534.77.

Banking.—In the banking business of the State the most important item is the deposits in the 90 savings banks, making a total of \$205,908,034.80 on 1 Jan. 1903, showing an increase during the year 1902 of \$10,180,796.74. There are in the State 81 national banks of deposit, with an aggregate capital of \$20,257,070 and a surplus amounting to \$9,455,220.48; 8 State banks, with capital amounting to \$2,240,000 and a surplus of \$878,000; 25 trust and investment companies, capitalized at \$6,143,474, with surplus of \$1,326,487.41; and 16 building and loan associations, with assets amounting to \$4,145,197.32. The oldest bank of

CONNECTICUT

deposit in the State is the Union Bank of New London, chartered in 1792, and still doing business under its old State charter. The Hartford National Bank was chartered at the same session of the general assembly, and changed to a national bank 13 June 1865.

Insurance.—The insurance business of the State centres in Hartford, where there are six of the eight stock fire-insurance companies, representing \$9,750,000 in capital, and \$13,939,214.03 in surplus. The other two companies represent \$350,000 in capital, and \$213,420.26 in surplus. Of the 16 mutual fire-insurance companies, 11 only appear active, representing gross assets of \$2,198,677.31, and surplus of \$1,715,019.24. The six life insurance companies of the State are all in Hartford. The latest report of their assets shows an aggregate of \$180,302,652.64, with policies in force amounting to \$35,405,746. There are also in the State six fraternal societies with assets amounting to \$863,769.08, and policies or certificates in force amounting to \$30,246,750.

Religion.—The ecclesiastical history of Connecticut would fill a large volume, and could only be properly treated by a profound theologian. It is enough to say that, at the beginning, the colony stood unique as a compromise between the rigid ecclesiasticism of Massachusetts Bay and Plymouth colonies, and the religious liberty which Roger Williams was, at the time, establishing in Rhode Island. Unique though it was, it can only be called a theocracy at the beginning, for the State was then the Congregational Church, pure and simple, and though others than church members could vote, they were obliged by the early code to vote taxes for the support of the Church. The process of emancipation from these theocratic conditions was slow, and did not reach perfection until the adoption of the new Constitution in 1818. Through this period of nearly two centuries there were executions for witchcraft; at Stratford in 1651; at Fairfield in 1653; and possibly at Windsor in March 1646 or 1647, if the journal of John Winthrop is to be taken as authority; and in the theological tenets which were adopted from time to time under direction of the general court and otherwise, we pass through a maze of solemn discussions of the Half-way Covenant, the Cambridge Platform, the Saybrook Platform, with the later New Lights and Old Lights arrayed against one another as Separatists and Conservatists. Legislation exempting the Church of England from taxation for support of the Congregational Church was had in 1727, and in 1729 was extended to cover the cases of Baptists and Quakers. In 1791 the right of incorporation was allowed, under certain restrictions, to all religious bodies. The first Baptist elder was ordained at New London in 1726, but the sect did not gain largely until the beginning of the 19th century. The Protestant Episcopal Church was not established under a regularly ordained bishop until after 1784, although it had made beginnings before that time, but was practically exterminated during the Revolution, owing to the toryism of its clergy. In 1789 the first Methodist Episcopal Church in the State was established at Stratford. The first Roman Catholic Church in Connecticut was established in 1830, and in 1843 the diocese of Hartford, embracing the entire State, was established.

The statistics of religious denominations are but partially available, only a few of the denom-

inations publishing reliable figures, most of them none whatever, and some inflated "estimates." The Protestant denominations are as usual divided into many sects. Of these the strongest is the historic original Church, and for generations the established one, the Congregational; it has nearly twice as many churches as any other one denomination, and fully twice as many members. The Protestant Episcopal and the Methodist Episcopal are about equal, next in order; and the Baptist not very far behind. The Roman Catholic Church is very strong, numbering from a third up to nearly half of the population of the cities and manufacturing villages, but less numerous in the rural districts. There are small numbers of Presbyterian, Lutheran, Universalist, and Catholic Apostolic churches, a few Unitarian, and some Jewish synagogues.

Charitable Institutions.—The educational institutions which are partly or wholly sectarian in character will be mentioned later in speaking of the general subject of education. The Roman Catholic Church maintains the following charitable institutions: one hospital, two orphan asylums, one home for the aged poor. Other charitable institutions in the State, not dependent on church support, but wholly or in part dependent on public funds are: 14 hospitals, 8 temporary county homes for children, 1 home for disabled soldiers, 1 home for soldiers' orphans, 1 hospital for the insane, 1 retreat for the insane, 2 institutions for instruction of the deaf, one institute and industrial home for the blind, 1 school for imbeciles, 1 almshouse for State paupers, 88 almshouses for town paupers, the paupers in 80 towns being provided for by securing board for them, or by assisting them at their homes. The charitable institutions depending solely on private support, are: 5 hospitals, 15 homes for the aged and friendless, 13 homes and asylums for the young. In addition to the foregoing there are 10 private sanitariums licensed by the State. A fee is charged to patients in these institutions. An additional State hospital for the insane has been authorized by the General Assembly of 1903.

Penal and Reformatory Institutions.—These are: 1 State prison, 8 county jails, 1 reform school for boys, called "the Connecticut School for Boys," 1 industrial school for girls.

The total amount expended for charities and corrections in 1901 was \$1,598,514.

Education, etc.—The educational system of Connecticut was planted almost literally with the first corn that was planted by the early settlers. From the small beginnings in the few towns the present system of public schools has evolved, aided materially in 1795 by the proceeds of Western Reserve lands, now in the State of Ohio, which were sold in order to establish a school fund. These lands, to the extent of about 3,500,000 acres, were granted to Connecticut by the United States in 1786, as a tacit compensation for her loss of the Wyoming territory by a decree of 1782. About 500,000 acres were granted by Connecticut to those within her jurisdiction who had suffered from the incursions of the British during the Revolution, and the remaining 3,000,000 acres were sold for the establishment of a school fund. This fund remains intact to the present day, and amounts to \$2,020,732.91, yielding an income of \$107,824.39, being less than one fourth of the amount paid by the State for the support of public schools under

CONNECTICUT

the law providing for payment by enumeration. Another fund, which the State has appropriated to the towns, is known as the town deposit fund, which was Connecticut's share of the apportionment from the surplus of the United States treasury in 1837, and which was apportioned by the State to the towns. Under the law of 1859, the entire income of this fund was to be used for education; but it has become so merged in the general treasuries of the various towns that it is difficult to get any specific account of the manner in which it is used. It amounted in 1901 to \$763,661.83, yielding a nominal interest of \$29,151.96. According to latest reports of the State board of education, "in most cases this interest exists on paper only." Beyond this State support, the common school system depends on taxation in the various towns and school districts to meet expenses. By a recent decision of the courts, a school district may, in lieu of the payment made by the State of \$2.25 for each enumerated school child, receive from the town the actual expense of conducting the schools for 36 weeks in the year. Education is compulsory, the limit of age for school attendance being from 7 to 16 years.

The control of the common school system is varied. A single town may conduct its schools by means of a committee, or it may divide itself into an indefinite number of school districts, each in charge of a committee, and all under the supervision of school visitors; or these districts may each be incorporated under the sole control of a board of education. The tendency, of late years, is toward the consolidation of the various districts in each town. Recent legislation provides for the extension of high school education. In addition to the common schools, to whose support it contributes, the State now supports three normal training schools for teachers, and has made an appropriation for the establishing of a fourth. It also controls and supports an agricultural college and experiment station. The public school buildings number 1,592, employing continuously 3,973 teachers, with many others employed during portions of the year. The number of children between the ages of 4 and 16 enumerated in 1902 was 209,019.

In addition to the public schools, there are in the State 161 private schools, of which 59 are parochial schools of the Roman Catholic Church, 4 parochial schools of the Lutheran Church, and the rest non-sectarian, being business colleges, boarding schools, and secondary or high schools. These 161 private schools employ 929 teachers, and are attended by 31,347 pupils. The higher institutions of learning are all supported by endowments or church funds. The principal of these are Yale University, Wesleyan University, Trinity College, the Hartford Theological Seminary, the Berkeley Divinity School, St. Thomas Catholic Seminary, and St. Joseph Catholic Seminary. Each of these has a large library of its own, that of Yale University being the largest in the State.

The State Library contains a large and valuable collection of the laws and official documents of other States and the general government; besides which it has accumulated a general collection, in which history is prominent. It also contains many rare and original documents, including the charter of 1662. There were, at last reports, 130 general public libraries

in the State, of which 99 were free and 33 charged fees for the use of books. Library legislation encourages the establishment of free libraries by giving books to the value of \$300 annually to towns which make appropriations to that extent.

The newspapers published in the State number 141, of which 37 are daily, 11 semi-weekly, and 93 weekly.

The principal historical societies are the Connecticut, New Haven Colony, New London County, Middlesex County historical societies, and the Bridgeport Scientific and Historical Society.

Government.—The government of Connecticut has been conducted under two different constitutions, the first of which was adopted in January 1638-9, and was fortified and protected by the charter of 1662; and the second of which was adopted as the result of a constitutional convention in 1818. This constitution, with its subsequent amendments, forms the organic law of Connecticut at present. Under it the governor, lieutenant-governor, secretary of state, treasurer, comptroller, and members of the General Assembly are chosen biennially by the people. Other State officers are appointed either by the governor, sometimes with and sometimes without the consent of the Senate, or by the General Assembly. This body is composed of a Senate, consisting of 24 members, and a House of Representatives, consisting of 255 members. One senator is elected from each of the 24 senatorial districts; two representatives each from 87 towns; and one representative each from 81 towns. The courts are the supreme court of errors, the superior court, the court of common pleas, and the district court, the judges of which are appointed by the General Assembly on nomination by the governor. Judges of city, borough, and town courts are appointed by the General Assembly. There are in the State 112 probate districts, the judges of which are elected by the people.

Population.—The population of the State is 908,420 by the census of 1900, showing an increase of 162,162 in 10 years. Of this population 670,210 are native born, and 238,210 foreign born. Only 3.8 per cent of the entire population are classified as illiterate, being the smallest percentage of illiterate population of any State in the Union except Massachusetts, which shows 3.5 per cent of illiterates.

The latest reported total of grand lists of taxable property is \$649,571,791. The State debt is \$1,663,100. The receipts for the year ending 30 Sept. 1902, were \$3,275,112.23; expenses \$3,113,687.57.

Owing mainly to dissatisfaction with the unequal town representation in the House of Representatives, a constitutional convention was called in January 1901, which drafted a new constitution, which was rejected by popular vote 16 June 1902. The representation in the House for the largest city and the smallest town thus remains often equal and practically the same as that for which the original constitution of 1638-9 provided. The division of senatorial districts, though intended to remedy this inequality, is not entirely a satisfactory solution of the difficult problem of establishing equal representation.

JONATHAN TRUMBULL,
Librarian of Otis Library, Norwich.

CONNECTICUT — CONNEMARA

Connecticut, a river of the United States, rising on the northern border of New Hampshire; it forms the boundary between Vermont and New Hampshire, passes through the western part of Massachusetts and the central part of Connecticut, and falls into Long Island Sound. The western branch forms by treaty the boundary between the United States and Canada to lat. 45° N. It is navigable for vessels drawing from 8 to 10 feet to Hartford, 50 miles from its mouth. Above this the navigation is impeded by rapids and falls, but subsidiary canals now make navigation possible for 25 miles above Hartford. The river is famed for its shad fisheries.

Connecticut Lakes, four small lakes in the northern part of Coos County, N. H., which are connected with the Connecticut River in the beginning of its course. They are named in numerical order, from southwest to northeast, the largest one, Connecticut Lake proper, being known as First Lake. The smallest two, Third Lake and Fourth Lake, which are very near the Canadian boundary, are the ultimate sources of the river.

Connecticut Reserve. See WESTERN RESERVE.

Connecticut Yankee in King Arthur's Court, a humorous tale by Mark Twain published in 1889. It is the story of a superintendent of an arms factory in Hartford, Conn., who one day lost consciousness from a blow received in a quarrel with his men, and when he awoke found himself in England at the time of King Arthur. The contact of Connecticut Yankee-dom with Arthurian chivalry gives rise to strange results; yet amidst all the fun and pathos, the courtliness, the sincerity, and the stern virtues — as well as what seems to us the ridiculousness — of the age are well shown.

Connective Tissue, the most important supporting tissue in the body. It is one of a general class, being associated with cartilage and bone. In connective tissues in general the cellular elements are inconspicuous, the intercellular substance giving character to the tissue. Connective tissue, in the limited sense, as well as the other connective tissues belonging to the group, are developed from the mesoderm, and consist of variously branched cells which possess a small amount of protoplasm and relatively large nuclei. The branches of the neighboring cells are united by threads of protoplasm, and between the cells there is usually a homogenous network. Three main types of connective tissue proper are described. These are mucous connective tissue, fibrillar connective tissue, and reticular connective tissue. The mucous connective tissue, such as is seen in the Wharton's jelly of the umbilical cord, consists of round or star-shaped branched cells with a large amount of differentiated mucous-like intercellular substances. This contains a few fine fibrils sometimes collected in bundles. It is very common in developing animals, and is not often represented in the adult human animal, but is very common in many adult lower animals. The fibrillar connective tissues or fibrils are of several kinds. In these there is an abundant intercellular substance, composed of fibrils which are fine filaments less than one micromillimetre in diameter, which are united in small bundles by a cement substance. The fibres vary

somewhat in color and somewhat in elasticity, and according to these minute variations they are white fibrous tissue, elastic fibrous tissue, yellow elastic fibrous tissue (qq.v.). Reticular connective tissue consists of a delicate network of anastomosing star-shaped cells, or a fibrous connective tissue in which the intercellular substance has disappeared. Such tissues are very common in the lymph nodes, spleen, and the mucous membrane of the intestinal canal.

Con'nelley, William Elsey, American author: b. Johnson County, Ky., 15 March 1855. Though almost entirely self-educated, he was for a number of years a school teacher in Kentucky and Kansas 1872-82. For four years (1888-92) he was in the wholesale lumber business, and then engaged in banking. His leisure has been chiefly devoted to the study of the history and antiquities of the North American Indians, and the States of the middle west. He compiled the first vocabulary of the Wyandot language, and has made valuable studies of the languages of the Delawares, Shawnees, and other tribes. His papers have mostly appeared in the publications of the Ontario, Kansas, Nebraska, and Ohio Historical societies, the Bureau of Ethnology, and Smithsonian Institution. Some of their titles are: 'The Provisional Government of Nebraska Territory' (1899); 'Notes of the Clan System of the Wyandots' (1899); 'Notes on the Folk-Lore of the Wyandots' (Journal of American Folk-Lore, 1900); 'James Henry Lane, the Grim Chieftain of Kansas' (1899); 'Kansas Territorial Governors' (1900); 'John Brown: the Last of the Puritans' (1900); 'The Overland Stage to California' (with Root, 1902).

Con'nellsville, Pa., a borough in Fayette County, on the Youghiogheny River, and the Baltimore & O. and the Pennsylvania R.R.'s, 57 miles east of Pittsburg. It is the centre of the most extensive coke-burning region in the United States, the ovens here producing half of the total coke output of the country. It also contains one of the largest lock factories in the country. Other important industries are machine shops, pump works, brick works, and coal mining. It is the seat of Cottage State Hospital. Pop. (1900) 7,160.

Con'nelly, Celia Logan, American journalist: b. Philadelphia 1837; d. New York City 19 June 1904. She was married to an American artist, M. K. Kellogg, in 1859. Her literary career began in London, but she returned to the United States after the death of her husband, and in 1872 married James H. Connelly (q.v.). Her novels include: 'Her Strange Fate' (1891); 'Saraz' (1891); etc. She has also written plays, notably 'An American Marriage'; and 'Gaston Cadol.'

Connelly, James H., American journalist: b. Pittsburg, Pa., 1840; d. 1903. He began newspaper work when 17 years old, writing for leading Chicago, New York, and San Francisco journals, and was a volunteer officer in the Civil War. His writings include short stories and special articles for newspapers and magazines, 'My Casual Death' and other novels. From 1889 till his death he was prominent in the Theosophist movement.

Connemara, kōn-ne-mā'ra, Ireland ("the Bays of the Ocean"), a boggy and mountainous district occupying the western portion of county

CONNER — CONQUEST OF PERU

Galway, about 30 miles long and 15 to 20 miles wide. Its coasts are very broken, and there are numerous small lakes. It is subdivided into Connemara Proper in the west, Jar-Connaught in the south, and Joyce County in the north.

Con'ner, David, American naval officer: b. Harrisburg, Pa., 1792; d. Philadelphia, 20 March 1856. He entered the navy as a midshipman in 1809; took part in the action between the *Hornet* and the *Peacock*, 24 Feb. 1813, becoming lieutenant on the former, 24 July 1813. He was severely wounded on the *Penguin* 23 March 1815, and his gallantry was rewarded by a medal from Congress, and a sword from his native State. During the Mexican war he blockaded the Gulf ports of Mexico, captured the port of Tampico; directed the landing of Gen. Scott's army at Vera Cruz, and took part in the reduction of San Juan de Ulloa. He was commandant at the Philadelphia Navy Yard when he died.

Con'nersville, Ind., the county-seat of Fayette County, situated on the Whitewater River and on the Cincinnati, C., C. & St. L. and the Cincinnati, H. & D. R.R.'s. It has a number of manufactures, including furniture, carriages, blowers, and woolens. There are several natural gas wells, and also electric lights. Pop. (1900) 6,836.

Con'nery, Thomas Bernard Joseph, American journalist: b. Ireland, 13 Oct. 1838. The greater part of his career was spent in the service of the *New York Herald*, on which he held nearly every position except that of financial editor, 1856-84. He was editor of *New York Truth*, 1885; 'Once a Week,' 1893-5; 'Collier's Weekly,' 1895. He was United States secretary of legation and *charge d'affaires* in Mexico, 1866-8. He has published: 'Don Tiburcio'; 'Black Friday'; 'History of American Comic Journalism'; 'Character Marks Autorial'; 'Essays on Literary Women of England.'

Conning Tower, the place in modern battleships where the commander stands during a naval engagement, and from which he directs the movements of the ship and men. The conning tower is built over the forward turret and is a circular chamber, scarcely six feet across and protected by walls of steel 12 inches thick. The roof is also of solid steel. Between the arched roof and the walls is a narrow slit from which the eye can sweep the whole horizon. The sharp pointed bow of the boat is just below, and directly in front are the two big guns that protrude from the turret. Throughout the engagement the commander is invisible to his men, his voice alone being heard through the speaking tubes and telephone with which the turret is fitted. In its centre are the steam-steering wheel, binnacle, and compass, and by the directing hand of the commander, standing beside the compass, the battle is fought. He touches one button and the great engines drive the boat through the water; another signals the discharge of the heavy guns; the touch of a third loosens the torpedoes, while a word through a tube sends a storm of steel and lead flying from the machine guns on the upper decks and in the round top.

Con'nor, Ralph. See GORDON, CHARLES WILLIAM.

Connor, Selden, American soldier: b. Fairfield, Maine, 25 Jan. 1839. He graduated at Tufts College, 1859; enlisted as a private in the 1st Vermont regiment 1861; became lieutenant-colonel of the 7th Maine regiment 1861, colonel of the 19th Maine 1864, and brigadier-general of volunteers June 1864. He was present at the battles of Fredericksburg, Gettysburg, and the Wilderness, where he was severely wounded. After the War he held several minor Federal offices, was governor of Maine 1876-8, United States pension agent 1882-6, and 1897. On 3 October 1889 he delivered the oration at the dedication of the Maine monuments at Gettysburg.

Conodonts (Gr. "cone-teeth"), minute fossils found in Palæozoic strata. They look very like the teeth of different kinds of fishes, some being simple slender pointed sharp-edged cones, while others are more complex, resembling in form the teeth of certain sharks. The old opinion was that they are minute teeth of fishes allied to the living hag-fishes and lampreys, but it is more likely that they are the jaws of annelids and naked mollusks.

Co'noid, in geometry, a surface generated by a straight line moving in such a manner that it constantly touches a curve and another straight line; similar to the cone, but having a straight line instead of a point for its apex.

Co'non, Athenian general: d. after 392 B.C. Having been defeated in a naval engagement at Ægospotamos by Lysander, he for a time went into exile; but being aided by Artaxerxes, king of Persia, he returned and defeated the Spartans near Cnidos, 394 B.C. Conon then began to rebuild the fortifications of Athens, and restored it to liberty and security.

Conon, of Samos, Greek astronomer and geometer who lived in the 3d century B.C. He was a friend of Archimedes and invented the curve known as the Spiral of Archimedes.

Conon'icut, R. I., an island in Narragansett Bay, eight miles long by one broad, about nine miles south of Providence. On its south end is a lighthouse.

Conoscope, kō'nō-skōp. See POLARISCOPE.

Conquest, Ida, American actress: b. Boston, Mass. Her first stage experience was at the age of eight, when she appeared as Little Buttercup in the Boston Museum juvenile production of 'Pinafore,' a part she played over 300 times. Her professional début was made in 1892 with Alexander Salvini at a special matinee performance at the Tremont Theatre, Boston, in which she played Isobel in 'Rohan the Silent.' Others of her parts are Phyllis Lee, in 'The Charity Ball'; Carey, in 'Alabama'; Sybil, in 'The Dancing Girl'; Renée de Cochefort, in 'Under the Red Robe'; Babiole, in 'The Conquerors.' See Strang, 'Famous Actresses of the Day.'

Conquest of Mexico, The, a noted history by William Hickling Prescott, published 1843. It was most favorably received by the public, 4,000 copies being sold in America within four months of the date of issue.

Conquest of Peru, The, a history published by William Hickling Prescott (1847). Of the five books into which this work is divided, the first treats of the wonderful civili-

CONRAD

zation of the Incas, the second of the discovery of Peru; the third of its conquest; the fourth of the civil wars of the conquerors; and the fifth of the settlement of the country. The first book hardly yields in interest to any of the others, describing as it does, on the whole, an unparalleled state of society. From the necessities of its material, the work is more scattered in construction than is the 'History of the Conquest of Mexico,' usually regarded as the author's most brilliant production.

Conrad I., emperor of Germany: d. 23 Dec. 918. He was elected king of Germany in 911; but Arnulf, Duke of Bavaria, and Henry, Duke of Saxony, disputed his title, and engaged the Huns to overrun Germany. Conrad is said to have received a mortal wound in combat with these revolted chiefs. He is chiefly noteworthy for the revival in his case of the elective title to the crown.

Conrad II., emperor of Germany: d. Utrecht 4 June 1039. He was the son of Henry, Duke of Franconia, and was elected king of Germany in 1024. Attempts were made to displace him, but without success, and in 1027 he was crowned emperor at Rome, in the presence of Canute, king of England, and Rudolph, king of Burgundy. He is regarded as the true founder of the Franconian or Salic line. He was often engaged in contests with the greater barons and princes of the empire, and endeavored to form a counterpoise to their influence by encouraging the formation of minor independent fiefs. With the same view he endeavored to appropriate several of the larger duchies to members of his own family, and thus convert the elective empire into a hereditary monarchy similar to that of France. These designs, though conducted with considerable ability, failed, mainly in consequence of the incessant contests in which he was engaged with the popes.

Conrad III., emperor of Germany: b. 1093; d. Bamberg, Germany, 15 Feb. 1152. He was of the house of Hohenstauffen; and was elected emperor in 1138. His title was disputed by Henry the Proud, Duke of Saxony, and the rivalry of these two princes was the germ of the factions afterward so famous under the names of Guelfs and Ghibellines. In 1146, at the diet held at Spire, Conrad was persuaded by the eloquence of St. Bernard to undertake a crusade, on which he set out the following year. It was fruitless and disastrous, and Conrad returned with the wreck of his army in 1149.

Conrad IV., emperor of Germany: b. Andria, Italy, 25 or 27 April 1228; d. Lavello, Italy, 21 May 1254. He was chosen king of the Romans in 1237, was a son of the great Emperor Frederick II., and like him excommunicated by the Pope, Innocent IV., who set up a rival emperor in William, Count of Holland. On the death of his father in 1250, Conrad marched into Italy to recover the towns which had declared against him. He took Naples, but could not get the investiture of the kingdom of Sicily from the Pope.

Conrad V., or **Conradin**, German prince: b. 1252; d. Naples 22 Oct. 1268. He was the son of Conrad IV., and the last of the Hohenstauffen. He accepted the invitation of the Italian Ghibellines to place himself at their head and the sale of a large portion of his pos-

sessions enabled him to raise troops. In the autumn of 1267 he crossed the Alps with 10,000 men, and at Verona was warmly received by the Scala family, the chief of the Ghibelline party. His relatives here, persuading him to part with his remaining possessions at a low price, deserted him with their followers, leaving but 3,000 men. The Ghibellines, however, remained true to him. Verona raised a large army, Pisa a fleet, and Rome, whose pontiff was forced to flee to Viterbo, opened its gates to him. Conradin entered lower Italy, and at Tagliacozzo met the French army under Charles d'Anjou, on whom the crown of Naples had been bestowed by Pope Urban IV. He beat Charles back, and his men, supposing the victory won, dispersed in search of plunder, when they were attacked by the French and utterly routed, 23 Aug. 1268. Conradin escaped, but was betrayed into the hands of Charles at Astura, who caused him to be beheaded in the market place of Naples.

Conrad, kōn'räd, **Frederik Willem**, Dutch engineer: b. Delft 1769; d. 1808. He was the pupil and friend of Brunings, who did so much for the construction of the sea dykes of Holland, and on his death succeeded him in his situation of inspector-general of sea dykes in the province of Rynland. He afterward held the office of administrator-general of the sea dykes in the Low Countries. He rendered a lasting service to his country by reclaiming large tracts of land from the sea, and more especially by the formation of a proper outlet for the waters of the Rhine.

Conrad, **George**, pseudonym of Prince George of Prussia (FRIEDRICH WILHELM GEORG ERNST), German dramatist: b. 12 Feb. 1826. He has experimented successfully with various forms of dramatic literature; and among his productions are: 'Cleopatra'; 'Yolantha'; 'The Talisman'; 'Christine of Sweden'; 'Elfrida of Mount Salerno' (1875); 'Catharine de Medici' (1884); 'Sappho' (1887); 'Where is Happiness?'; 'The Marchioness of Brinvilliers'; 'Phædra.'

Con'rad, **Joseph**, English novelist: b. Poland 1856, the son of a Polish revolutionist. He was educated in Cracow, and at 13 went to sea, becoming subsequently a captain in the merchant service. After a long experience as a sea rover, he settled in England and began putting his various experiences into literature. His writings include: 'Almayer's Folly' (1895); 'An Outcast of the Islands' (1896); 'The Nigger of the Narcissus,' issued in America as 'The Children of the Sea' (1897); 'Lord Jim' (1900); 'The Inheritors' (with F. M. Hueffer, 1901); 'Youth and Other Tales' (1902); 'Typhoon' (1902).

Conrad, kōn'räd, **Michael Georg**, gā'örg, German novelist: b. Gnodstadt, Franconia, 5 April 1846. He founded at Munich, in 1885, 'Society,' a journal intended to be an organ of the "naturalistic" school. He spent several years in Paris, and many of his sketches relate to phases of life in France. Among his novels are: 'The Wise Virgins'; 'The Fool's Confession.' He is author of a comedy, 'The Emancipated,' and the drama, 'The Firm of Goldberg.' On social and political questions he has written: 'The German Reveille'; 'Justice, the State, and the Modern Spirit.'

CONRAD — CONSCIENCE

Con'rad, Robert Taylor, American lawyer and dramatist: b. Philadelphia, 10 June 1810; d. there 27 June 1858. He wrote: 'Aylmere' (1852), a tragedy in which Edwin Forrest played the role of Jack Cade; 'Conrad of Naples,' a tragedy; 'Poems' (1852); etc.

Conrad, Timothy Abbott, American naturalist: b. New Jersey Aug. 1803; d. Trenton, N. J., 9 Aug. 1877. His special study was American palæontology, but he investigated many other departments of natural history. He prepared the New York State geological report for 1837, was palæontologist of the New York Geological Survey, 1838-41, and made the reports on the palæontological discoveries in the Pacific R.R. survey and the Mexican boundary survey. He published: 'American Marine Conchology' (1831); 'Fossil Shells of the Tertiary Formations of the United States' (1832); 'Monography of the Unionidæ' (1835-47); 'Check List of the Invertibrate Fossils of North America' (1866). A very full list of his numerous papers will be found in the Royal Society's 'Catalogue of Scientific Papers.'

Conrad von Wurzburg, kōn'rād fōn vūrts'-boorH, German poet: d. Basel 1287. Fertile in imagination, learned, and, although marking the decline of Middle High German poetry by his prolix and artificial style, he was probably the most perfect master of German versification that had appeared up to his own day. His last poem, left unfinished, has for its subject, 'The Trojan War.' But he appears to most advantage in his smaller narrative poems, of which the best are: 'Engelhart'; 'Otto'; 'Der Welt Lohn'; 'Silvester'; 'Alexius'; 'Der Schwanritter'; and 'Die Goldene Schmiede.' His 'Lieder' have been edited by Bartsch (1870).

Conradi, Hermann, hēr'män kōn-rä'dē, German literary critic and essayist: b. Jetznitz 1862; d. 1890. As lyricist and critic he was a representative of radical realism, a follower of Tolstoy, Ibsen, and Nietzsche. His genius was forceful, but undisciplined, and his writings lack repose and polish.

Conradin (kōn'rä-dēn) of Suabia. See CONRAD V.

Conried, Heinrich, American impresario: b. Bielitz, Austrian Silesia, 13 Sept. 1855. Graduated from the Oberrealschule of Vienna, he came to the United States, and was for several years a manager of German theatrical and operatic organizations. As director of the Irving Place Theatre, New York, he became known for excellent presentations of German classic drama, frequently repeated at Cambridge and other university centres. In 1903 he became director of the Metropolitan Opera-house, where on 24 Dec. of that year he presented Richard Wagner's 'Parsifal' for the first time outside of Bayreuth.

Conring, Hermann, hēr'män kōn'rīng, Dutch scholar: b. Norden, East Friesland, 9 Nov. 1606; d. Helmstedt, Brunswick, 12 Dec. 1681. He studied at Helmstedt and Leyden, devoting himself chiefly to theology and medicine; was appointed, in 1632, professor of philosophy at Helmstedt, in 1636 professor of medicine, and remained in this city until his death. He was distinguished in almost every department of knowledge, and the title of a counselor was conferred on him by the kings of Denmark and Sweden and the elector of the Palatinate. He

was then made professor of law. The German emperor likewise distinguished him. From far and near his advice was sought in political and legal cases. He did a great deal for the history of the German empire, and for the improvement of German public law, in which he opened a new path. He wrote: 'De origine juris Germanici' (1643); 'Excertationes de re publica Germanica' (1675); and very many other treatises to the number of over 100. His works, with his biography, were published in 1730.

Consalvi, Ercole, ər-kō'lē kōn-säl'vē, Italian statesman and cardinal: b. Toscanella 8 June 1757; d. Rome 24 Jan. 1824. Having in 1797 entered the public service of the court of Rome in an humble capacity, he was four years later one of the 12 auditors of the Rota, a commission in effect a supreme court of appeal in all matters secular as well as ecclesiastical. The French having taken possession of Rome, Consalvi falsely accused of having had part in an assassination, was for a while held in prison and then banished. When Pius VI. died, Consalvi was largely instrumental in procuring, in the conclave held at Venice, the election of Cardinal Chiaramonti to the papal throne as Pius VII., and thereafter was that pontiff's chief counselor: he was now second only to the Pope in all dealings with the European powers and specially with Napoleon. In the course of the controversies between Rome and the French emperor, he showed a firmness that won for him the unwilling respect indeed of Napoleon, but also his irreconcilable enmity. It was while the emperor was flushed with the victory of Austerlitz that he sent to Consalvi through Cardinal Fesch the message, "Tell Consalvi that if he loves his country he must either resign or do what I demand"; and the cardinal prudently withdrew from public life for a season. In 1809 he had an interview with Napoleon at Paris, in which the emperor in effect made an apology for that act; but Consalvi persisted in his opposition to Napoleon's designs; and was one of the 13 cardinals who refused to concede the lawfulness of the second marriage of Napoleon. In punishment of his obstinacy in that matter he was held in confinement three years at Rheims. After the fall and banishment of Napoleon, he resumed his station in the papal court and devoted himself to the institution of many reforms in the government, being in effect chief governor of Rome and the papal states. He was always a liberal patron of art, literature and science. He left the bulk of his property to the poor. Consult Créteineau-Joly, 'Mémoires du Cardinal Consalvi.'

Conscience, kōn-syāns, **Hendrik**, Flemish novelist: b. Antwerp, 3 Dec. 1812; d. Brussels 10 Sept. 1883. Having educated himself, he taught for a short time in a school, and then served in the army from 1830 till 1836. He was for a time tutor in Flemish to the royal princes, and from 1868 conservator of the Wiertz museum at Brussels. His novels are partly based on the history of his country, partly pictures of everyday Flemish life. Among the former may be mentioned: 'The Year of Wonders' (1837); 'The Lion of Flanders' (1838); 'Jakob van Artevelde' (1849); 'The Peasants' War' (1853); 'Batavia' (1858); 'The Burgomaster of Liège' (1866); and 'Everard T'Serclaes' (1874); and of the latter, which

CONSCIENCE — CONSCIOUSNESS

are well written, very accurate and highly sympathetic, the chief are: 'What a Mother Can Endure' (1843); 'The Conscript' (1850); 'Wooden Clara' (1850); 'Blind Rosa' (1850); 'The Poor Nobleman' (1851); 'The Miser' (1853); 'The Young Doctor' (1860); and 'Maternal Love' (1862). He wrote also a musical drama, 'The Poet and His Dream' (1872). Many of his works have been translated into almost every European language. In 1881, on the occasion of the appearance of his hundredth volume, the Flemish people paid him a splendid tribute. The 10th anniversary of his death was observed in Antwerp with public ceremonies.

Con'science, the judgment or dictate of the practical intellect which from general moral principles pronounces that something is to be avoided because it is evil, or to be done because it is good. (See ETHICS.) Conscience Clause is the term applied to a clause in an act or law when it relieves persons who object on religious grounds to do something enjoined by the act or law, from any penalty to which they would otherwise be liable.

Conscience Money, stolen or wrongfully acquired money returned to its rightful owner when conscience is awakened to a sense of right dealing. In the United States such money paid into the treasury at Washington by self-avowed debtors anonymously is known as the conscience fund. In England the phrase is applied to money forwarded, as a rule anonymously, to the chancellor of the exchequer for unpaid income tax. It amounts to some thousand pounds a year.

Conscience Whigs. See WHIGS.

Consciousness (Ger. *Bewusstsein*; Fr. *conscience*; It. *conscienza*) is the term by which modern psychology aims to distinguish that which is characteristically and actively mental from that which is merely physical or vital. A number of statements regarding the inclusions and exclusions of the concept might be made, but a concise and accurate definition, in the present state of psychological knowledge, is impossible. This for two reasons: First, no particular group of objective phenomena can be pointed out as answering to what we mean when we employ the term, though there are numerous groups which may be taken as signs or manifestations of consciousness. Hence one common means of definition in the sciences, namely, the designation, analysis, and reduction to common and indispensable properties of similar phenomena, is unavailing in the present instance. Secondly, consciousness cannot be in any sense identified with any of the manifestations which signalize its presence. When I am actively engaged in some thought process, I am certainly conscious, but this is not what I mean by consciousness; for the term means something more than the sum of the states or manifestations of mind.

In lieu of a definition the best way of approaching a knowledge of the meaning of the term is analysis of its connotation. The word consciousness is an abstract noun derived from the more concrete adjective conscious. When we apply this latter adjective we mean to call attention to the awareness characterizing the normal mind when active, that is, when not asleep or in a swoon. Conscious is therefore used in opposition to unconscious, and implies

a condition of mind in which the subject is to some degree, be it ever so slight, aware of his own activity. The use of the two words conscious and unconscious brings to our notice a peculiar fact. An unconscious state is more striking than a conscious state just because it is less an integral part of the subject's ordinary experience. It is also from the observer's point of view wholly objective for the simple reason that the observation of an unconscious state in one's self would be in the nature of things a contradiction in terms. When we are in the profoundest sleep, we can make no observations upon our own states. This peculiarity permits us to draw one accurate distinction between consciousness and non-consciousness (including unconsciousness), namely, the state of consciousness is always to some degree its own object, or, in other words, the possessor of conscious mind is always in some wise looking in upon his own active ongoings. On the contrary, the non-conscious can never be an object for itself, but must always be an object for some (other) consciousness. It follows that one of the principal means of psychological investigation, introspection, can never apply to the unconscious. It would be no more absurd to ask a log of wood how "woodiness" feels than to ask an unconscious mind to give a first-hand account of itself. And when people speak of their experiences during a fainting fit what they really refer to is their sensations just as they are coming back to the world of life and light. Although introspection is not applicable to unconscious conditions of the normally conscious, observation and experiment can be applied with good results, and some interesting data have been secured in this way; though they are strictly speaking physiological rather than psychological.

This reference to the unconscious has seemed necessary here because the conscious has to be determined so largely by limitation. All that has been said, it will be observed, does not aim to define the term we are discussing, but simply seeks to make its psychological application better known by connecting it with ordinary usage. Bearing this purpose in mind, we cannot do better than to quote the explanation of the word given in Ladd's 'Psychology, Descriptive and Explanatory' (p. 30).

Whatever we are when we are awake, as contrasted with what we are when we sink into a profound and dreamless sleep, that it is to be conscious. What we are less and less, as we sink gradually down into dreamless sleep, or as we swoon slowly away, and what we are more and more, as the noise of the crowd outside tardily arouses us from our after-dinner nap, or as we come out of the midnight of the typhoid fever crisis, that it is to become conscious.

We detect in this descriptive statement of the characteristic phenomena of consciousness a recognition of degrees or stages, as well as of a limen or threshold, at which the unconscious mind awakes to consciousness, even though it be but a minimal consciousness. Of these we must now speak.

The phrase, threshold of consciousness, which has figured very largely in recent psychological literature, is a metaphorical expression for the common experience that a certain intensity of stimulus is necessary in order that the subject may have a conscious state. It might be used with perfect propriety broadly enough to include every form of coming to consciousness. In reality, however, the phrase, which Herbert

CONSCIOUSNESS

coined and Fechner used in his psycho-physical investigations, is limited to sense experience, being employed to designate the point where an increasing stimulus arouses a responsive sensation, or where a decreasing stimulus ceases to be perceived. In this instance there is a case of arising to the consciousness of a given object, rather than the return to consciousness as a mode of mind. However, the two cases are not so unlike as might at first sight appear, for the return from consciousness after sleep is usually signaled by the tardy perception of a sensory stimulus that has perhaps been knocking at the vestibule of consciousness all unheeded for some time.

We may pass over the various intervening degrees of consciousness with a mere allusion, and go on to consciousness in its most alert form, namely attention. Psychologists are accustomed to recognize two sub-species of attention, voluntary and non-voluntary. The distinction between them is based upon the presence or absence of volition at the initial moment of the redirection of consciousness. Otherwise they are essentially the same; and as non-voluntary or forced attention usually becomes voluntary after the first reception of the stimulus, both may be described by an inventory of the attributes of the voluntary variety. Prof. James in his interesting chapter on 'Attention' (Psychology, Vol. I., ch. xi.) calls our notice to the neglect of attention by the psychologists of the English empiricist school, and assigns as the reason their proneness to neglect and minimize the spontaneous tendencies of the mind. It is on attention as marking something especially self-initiated in mental activity, that the advocates of a rationalistic view of mind love particularly to dwell. This furnishes us with a clue to one of the attributes of attention. It is in a very special sense an active and energizing state of mind. When a sense stimulus impinges on an end-organ, the state of mind ensuing is in a way passive and receptive; but the moment consciousness awakens to the presence of the sensation and grows absorbed in contemplating it, there is an end to passivity. Whatever be said of sensation, attention, once aroused, is a pre-eminently active form of consciousness, and from the instant that the mind lays a selective hold upon the object soliciting it until it voluntarily lets go of it, there are numerous signs of the most intense phase of mental activity. The sympathetic workings of the facial muscles during such a period, the feeling of tension and uneasiness about the head, the firm set of the teeth, all these things bear witness to the forth-putting of great nervous energy. Another marked characteristic of attention is its tendency to fluctuate even when under what is seemingly the most steadfast control. Though the more noticeable and lasting fluctuations may with training be subjected to control, the insensible variations which are always to be discovered by experiment, persist in spite of the best training of the will.

The nature of attention is not fully made out. Some of the older schools of psychologists regarded it as a special faculty. This view is not tenable. Non-voluntary attention may perhaps be regarded as an absorbed form of consciousness, while voluntary attention is but the entire conscious self dominated by intelligent will. What we mean by attention is so well illus-

trated by experience that a formal definition scarcely seems necessary. A happy comparison which aids somewhat in understanding the working of attention is that borrowed from vision. Just as one may at any moment bring what is on the periphery of the field of vision to the point of keenest vision by a slight turn of the eyeball, so that which is at any moment on the bounds of the field of consciousness may be brought under the searchlight of the attention by a shifting of the mind in that direction.

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Consciousness, Biological Aspects of. Consciousness is at once the oldest problem of philosophy and one of the youngest problems of science. The time is not yet for giving a satisfactory definition of consciousness, and we must fain content ourselves with the decision of the metaphysician, who postulates consciousness as an ultimate datum or concept of thought, making the brief dictum *cogito, ergo sum* the pivot about which his system revolves.

Opinions concerning consciousness are many and so diverse as often to be mutually exclusive, but they may be divided into two principal classes. The first class includes all those views which make of consciousness a real phenomenon; the second, those views which interpret it as an epiphenomenon. The fundamental question is: Does or does not consciousness affect directly the course of events?—or, stated in other words, is consciousness a true cause? In short, we encounter at the outset the problem of free-will.

The opinion that consciousness is an epiphenomenon has gained renewed prominence in recent times, for it is a collateral result of the doctrine of monism. Monism itself is postulated chiefly upon the two greatest discoveries of the 19th century—the law of the conservation of energy, and the law of the evolution of species. Both laws establish a greater unity in the phenomena of the universe than mankind had previously been able to accept. With these two unities in mind, what could be nearer than the thought that the unity goes still deeper, and that the phenomena of the inanimate or physical, and of the living world are fundamentally identical? The progress of physiological science has greatly increased the impetus toward the adoption of this thought as the cardinal dogma of the new faith, because the work of physiologists has been so devoted to the physical and chemical phenomena of life, that the conviction is widespread that all vital phenomena are capable of a physical explanation. As to what is behind the physical explanation, complete agnosticism is the only possible attitude. Such in barest outline is the history of modern monism—the

CONSCIOUSNESS

doctrine that there is only one kind of power in the universe.

It is evident that monism involves the elimination of two concepts, God and consciousness. It is true that monists sometimes use these words, but they deny the concept for which the words actually stand. Now consciousness is too familiar to all men to be summarily cast aside and dismissed. Some way must be found to account for it. From the monistic standpoint there is a choice between the alternatives; consciousness is either a form of energy, like heat, etc., or merely an epiphenomenon. As there is no evidence that consciousness is a form of energy, only the second alternative is available, and it has been adopted by the monists.

It is essential to have a clear notion of what is meant by an epiphenomenon. Etymologically the word indicates something which is superimposed upon the actual phenomenon. It designates an accompanying incident of a process which is assumed to have no causal relation to the further development of the process, and corresponds to the logical term "accident" as distinguished from cause. In practice it is used chiefly in regard to the relation of the mind or consciousness to the body, and is commonly employed by those philosophers who believe that consciousness has no causal relation to any subsequent physiological process.

The epiphenomenon hypothesis of consciousness scarcely does more than explain consciousness very easily by merely assuming that it does not require to be explained at all. Is not that really the confession made by the famous assertion that the consciousness of the brain no more requires explanation than the aquosity of water?

Consciousness is better regarded as a biological phenomenon, which the biologist has to investigate in order to increase the number of verifiable data concerning it. In that way, rather than by speculative thought, is the problem of consciousness to be solved, and it is precisely because biologists are beginning to study consciousness that it is becoming, as I said in opening, the newest problem of science.

We must look to biologists for the mighty generalizations to come rather than to the philosophers because great new thoughts are generated more by the accumulation of observations than by deep meditation. The principal contribution of science to human progress is the recognition of the value of accumulating data which are found outside of ordinary human experience.

So, in regard to consciousness, for the present it is more important to seek additional positive knowledge than to hunt for ultimate interpretations. It is the department of biology to which properly belongs the problem of consciousness. The results of experimental psychology are still for the most part future. But we may obtain valuable preliminary notions concerning consciousness from our present biological knowledge.

We must begin by accepting the direct evidence of our own consciousness as furnishing the basis. We must further accept the evidence that consciousness exists in other men essentially identical with the consciousness in each of us. The anatomical, physiological, and psychological evidence of the identity of the phenomena in different human individuals is, to a scientific mind, absolutely conclusive.

The most striking distinction of the processes in living bodies, as compared with those in inanimate bodies, is that the living processes have an object—they are teleological. The distinction is so conspicuous that the biologists can very often say why a given structure exists, or why a given function is performed, but how the structure exists or how the function is performed he can tell very imperfectly, more often not at all. Consciousness is a particular example, and an excellent one of this peculiarity of biological knowledge. We do not know what it is, we do not know how it functions, but we do know why it exists. Those who are baffled by the elusiveness of consciousness when we attempt to analyze it will do well to remember that all other vital phenomena are equally and similarly elusive.

In order to determine the teleological value of consciousness, we must endeavor to make clear to ourselves what the essential function is which it performs. As I have found no description or statement of that function which satisfied me, I have ventured, perhaps rashly, to draw up the following new description:

The function of consciousness is to dislocate in time the reactions from sensations.

The description calls for a brief explanation. We receive constantly numerous sensations, and in response to these we do many things. These doings are, comprehensively speaking, our reactions to our sensations. When the response to a stimulus is obviously direct and immediate we call the response a reflex action, but a very large share of our actions are determined in a far more complicated manner by the intervention of consciousness, which may do one of two things: (1) Stop a reaction, as, for example, when something occurs, calling, as it were, for our attention, and we do not give our attention to it. This we call conscious inhibition. It plays a great role in our lives; but it does not mean necessarily that inhibited impressions may not survive in memory and at a later time determine the action taken; in such cases the potential reaction is stored up. (2) Consciousness may evoke a reaction from a remembered sensation and combine it with sensations received at other times. In other words, consciousness has a selective power, manifest both in choosing from sensations received at the same time and in combining sensations received at different times. It can make synchronous impressions dyschronous in their effects, and dyschronous impressions synchronous. But this merely paraphrases our original description. The function of consciousness is to dislocate in time the reactions from sensations.

This disarrangement and constant rearrangement of the sensations, or impressions from sensations, so that their connections in time are altered seems to me the most fundamental and essential characteristic of consciousness which we know. The characteristic we are considering is certainly important, and so far as the available evidence goes it belongs exclusively to consciousness. Without it life would have no interest, for there would be no possibility of experience, no possibility of education.

Now the more we have learned about animals, the better we appreciate the fact that in them only such structures and functions are preserved as are useful, or have a teleological value. Formerly a good many organs were

CONSCIOUSNESS

called rudimentary or vestigial, because they had no known function. But in many cases the functions have since been discovered. Such, for example, were the pineal gland, the pituitary body, the suprarenal capsules and the Wolffian body in man. It is accordingly well-nigh impossible for us to imagine that consciousness was evolved, as it has been, unless it had been bionomically useful. Let us therefore consider the value of consciousness from the standpoint of bionomics (a convenient term, recently gaining favor, for the economics of the living organism. Bionomics seems preferable to ecology, which some writers are adopting from the German).

We must begin with a consideration of the nature of sensations and the object of the reactions which they cause. In the simpler forms of nervous action a force, usually but not necessarily external to the organism, acts as a stimulus which causes an irritation; the irritation produces a reaction. Within the ordinary range of the stimuli to which an organism is subjected, the reaction is teleological, that is, it tends to the benefit of the organism. An organism might conceivably be maintained solely by this mechanism in co-operation with the physical laws which govern all matter. Life in such an organism would be a succession of teleological processes, essentially mechanical and regulated automatically by the organism. By far the majority of biologists regard plants as essentially conforming to this type of life.

A sensation involves the interpolation of consciousness between the stimulation and the reaction, and in consequence there is established the possibility of a higher order of adjustment to the external world than can be attained through the teleological reaction to a stimulus. This possibility depends upon the fact that the intervention of consciousness permits an adjustment in accordance not merely with the immediate sensation, but also, and at the same time, in accordance with earlier sensations. Thus, for example, the child sees an object, and its reaction is to take hold of the object, which is hot and hurts the child. Later the child sees the object again and its natural reaction is to take hold of it again, but the child now reacts differently because its consciousness utilizes the earlier as well as the present sensation; the previous sensation is dislocated in time and fused with the present sensation and a new reaction follows. No argument is necessary to establish the obvious conclusion that an organism which has consciousness has an immensely increased scope for its adjustments to the external conditions; in other words consciousness has a very high value for the organism.

A sensation gives information concerning the external world. Perhaps science has achieved nothing else which has done so much to clarify philosophy as the demonstration that the objective phenomena are wholly unlike the subjective sensations. Light is a series of undulations, but we do not perceive the undulation as such, but as red, yellow, and green. Objectively red, yellow, and green do not exist. Similarly with the vibrations of the air, certain of which cause the sensation of sound, which is purely subjective. But the sound gives us information concerning our surroundings, which we utilize for our teleological needs, although in nature external to us there is no sound at all. Similarly

all our other senses report to us circumstances and conditions, but always the report is unlike the external reality. Our sensations are symbols merely, not images. They are, however, bionomically sufficient because they are constant. They are useful not because they copy the external reality or represent it, but because, being constant results of external causes, they enable consciousness to prophesy or foresee the results of the reactions of the organism, and to maintain and improve the continual adjustment to the external reality.

Consciousness is not only screened from the objective world from which it receives all its sensations, but also equally from immediate knowledge of the body through which it acts. As I write this sentence I utilize vaso-motor nerves, regulating the cerebral blood currents, and other nerves which make my hand muscles contract and relax, but of all this physiological work my consciousness knows nothing, though it commands the work to be done. The contents of consciousness are as unlike what is borne out from it as they are unlike what is borne in to it.

The peculiar untruthfulness to the objective which consciousness exhibits in what it gets and gives would be perplexing if we had not recognized in consciousness a device to secure better adjustment to external reality. For this service the system of symbols is successful, and we have no ground for supposing that the service would be better if consciousness possessed direct images or copies instead of symbols of the objective world.

Our sensory and motor (and other organs in efferent relations to consciousness) organs are the servants of consciousness. A large part of our anatomical characteristics exist for the purpose of increasing the resources of consciousness, so that its bionomic function may be more efficient. Our eyes, ears, taste, etc., are valuable, because they supply consciousness with data; our nerves, muscles, bones, etc., are valuable, because they enable consciousness to effect the needed reactions.

Let us now turn our attention to the problem of consciousness in animals. The comparative method has an importance in biology which it has in no other science, for life exists in many forms which we commonly call species. Species, as I once heard it stated, differ from one another with resemblance. The difference which resembles we term an homology. Our arm, the bird's wing, the lizard's front leg, are homologous. The conception of homology both of structure and of function lies at the basis of all biological science. That animals have a consciousness homologous with the human consciousness there is conclusive proof. As regards at least mammals—I think we could safely say as regards vertebrates—the proof is the whole sum of our knowledge of the structure, functions and life of these animals.

As we descend the animal scale to lower forms there is no break and therefore no point in the descent where we can say, "Here animal consciousness ends, and animals below are without it." It seems inevitable therefore to admit that consciousness extends far down through the animal kingdom, certainly at least as far down as there are animals with sense organs or even the most rudimentary nervous system.

CONSCIOUSNESS

The series of considerations which we have had before us lead directly to the conclusion that the development and improvement of consciousness has been the most important, really the dominant, factor in the evolution of the animal series. The sense organs have been multiplied and perfected in order to supply consciousness with a richer, more varied, and more trustworthy store of symbols corresponding to external conditions. The nervous system has grown vastly in complexity in order to permit a constantly increasing variety in the time dislocations of sensation. The motor and allied apparatus have been multiplied and perfected in order to supply consciousness with more possibilities of adjustment to external reality which might be advantageous.

If we thus assign to consciousness the leading role in animal evolution we must supplement our hypothesis by another, namely, that conscious actions are primary, and reflex and instinctive actions secondary; or, in other words, that, for the benefit of the organism, conscious actions have been transformed into reflexes and instincts. As we all know, new actions are performed with difficulty and slowly, but if often repeated they are soon easier and more rapid. If a given reaction to a sensation or group of sensations through consciousness is advantageous to the organism and the environment is such that the sensation is often repeated, then a habit is formed and the response becomes more rapid, and almost without participation of consciousness. The usefulness of conscious reactions is that they are determined not merely by the present sensation, but also by past sensations, but they have the defect that they are slow. We can readily understand that it would aid an organism to have the quicker reaction substituted, and we thus recognize a valid teleological reason for the replacement of conscious action by habits in the individual, by instincts in the race.

A frank unbiased study of consciousness must convince every biologist that it is one of the fundamental phenomena of animal life, at least, if not of all life.

The teleological impress is stamped on all life. Vital functions have a purpose. The purpose is always the maintenance of the individual or of the race in its environment. The entire evolution of plants and animals is essentially the evolution of the means of adjustment of the organism to external conditions, and consciousness is a conspicuous, a commanding factor of adjustment in animals. Its superiority is so great that it has been, so to speak, eagerly seized upon by natural selection and provided with constantly improved instruments to work with. A concrete illustration will render the conception clearer. In the coelenterates, the lowest animals in which we can recognize sense organs, the structure of them is very simple, and they serve as organs of touch and of chemical sensation resembling taste. In certain jellyfishes we find added special organs of orientation and pigmented spots for the perception of light. In worms we have true eyes and vision. In vertebrates we encounter true sense of smell. Fishes cannot hear, but in the higher vertebrates, that is, from the amphibians up, there are true auditory organs. In short, both the senses once evolved are improved and also new senses are added. It is perfectly conceivable that there

should be yet other senses, radically different from any we know. Another illustration, and equally forcible, of the evolution of aids to consciousness might be drawn from the comparative history of the motor systems, passing from the simple contractile thread to the striated muscle fibre, from the primitive diffuse musculature of a hydroid to the highly specialized and correlated muscles of a mammal.

In the lowest animals the range of possible adjustment is very limited, and the variety of possible actions small, and they cover also a small period of time. In animals which have acquired a higher organization the adjustments are more complex; the reactions are more varied and cover a longer period of time. The next great advance is marked by the establishment of communication between individuals of the same species. The investigation of this phenomenon is one of the most important duties of the comparative physiologist. Its bionomic value is obviously great, for it allows an individual to utilize the experience of another as well as its own. We might, indeed, compare it with the addition of a new sense, so greatly does it extend the sources of information. The communication between individuals is especially characteristic of vertebrates, and in the higher members of that sub-kingdom it plays a very great role in aiding the work of consciousness. In man, owing to articulate speech, the factor of communication has acquired a maximum importance.

It seems to me inconceivable that the evolution of animals should have taken place as it has, unless consciousness is a real factor and dominant. Accordingly I hold that it actually affects the vital processes. There is, in my opinion, no possibility of avoiding the conclusion that consciousness stands in immediate causal relations with physiological processes. To say this is to abide by the facts, as at present known to us, and with the facts our conceptions must be made to accord.

The future investigation of consciousness must separate the study of what it does from the study of what it is. Consciousness has been viewed here as a device to regulate the actions of the organisms so as to accomplish purposes which on the whole are useful to the organisms, and accordingly we have termed its function teleological. If this view is correct it accounts for the limitations of consciousness, its mechanical mode of work, its precision, and definiteness of action. The very fact that consciousness is of such high value in the bionomy of an animal renders it obvious that it must be subject to law. Accordingly it appears to us regulated as do the functions of protoplasm. Hence to certain modern thinkers it presents itself as a function of protoplasm, or, as it may be better stated, as a state or condition of protoplasm.

The internal evidence of consciousness is against the view that consciousness is a state or condition of protoplasm; it presents to us conscious actions depending upon consciousness. As before stated I believe that this evidence must be accepted. Now all the sensations of consciousness are derived from physical force, and all the acts of consciousness are manifested through physical force; hence if it has any real power consciousness must be able to change the form of energy. I propose the hypothesis:

CONSCIOUSNESS

Consciousness has the power to change the form of energy, and is neither a form of energy nor a state of protoplasm.

By this hypothesis there are two fundamentally different things in the universe, force and consciousness, and the universe consists of force and consciousness. As consciousness by our hypothesis can initiate the change of the form of energy, it may be that without consciousness the universe would come to absolute rest.

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Consciousness, Disorders of. Consciousness as evidenced in action is here under discussion. Consciousness *per se* as an entity is here regarded as incomprehensible. It is accepted solely as a mode of interpretation. The variations of normal consciousness are so manifold and extended that it is only by snatching, as it were, some fragments of peculiar character and by force of words more or less descriptive, that it is possible to circumscribe and limit the phenomena within bonds sufficiently narrow to permit of a classification. Thus any discourse on disorders of consciousness must be fragmentary at best, and when it is realized that the gamut of normal consciousness in individuals can be bound only in isolated fragments, the difficulties in the way of similar subdivision of personalities in the pathological field become apparent.

One of the first difficulties is drawing a line between normal and abnormal states of consciousness, as all states of consciousness may be said to glide one into another. In the intoxicated, disordered consciousness so alters the individual as to render him not only obnoxious to society, but a menace to himself and to society. Thus any definition of normal or abnormal should take into consideration the fact that society itself makes the definitions and that abnormal conduct is a matter really of considerable range in time and place and social customs. Distinctly anti-social conduct is branded abnormal at once.

In discussing the subject of disorders of consciousness it has been the custom in times past to describe three general types such as exalted, diminished, and perverted conscious states. This method of classification, however, is solely artificial and has no relation whatever to any pathological state which may bring about a disturbance of consciousness, for exalted states may occur in a variety of diseases as may depressed conditions also, and in fact both depressed and exalted consciousness occasionally occur in the same type of disease.

For general purposes the disorders of consciousness may be divided into four general groups. These are: (1) Disorders of sleep and their allied phenomena; (2) conscious states in the allied neuroses, hysteria, and epilepsy, including automatism, amnesia, double personality, etc.; (3) disordered conscious states due to exogenous intoxications; (4) insanities. This outline has certain justification in clinical experience at least. Under the first subdivision there may be included a large number of allied conditions, the most striking feature of which is a so-called dissociation of consciousness. By this is meant that normal waking consciousness with its accuracy of observations is in temporary abeyance and that lower cerebral centres are

operative, causing the individuals to perform motor acts of which they may have only a dim conscious recollection. Somnambulism or sleep walking is one of the simplest types of this disordered conscious state. Individuals who walk in their sleep should not be considered as unconscious. They are distinctly conscious, but the consciousness is an extremely restricted one. The clinical phenomena of sleep walking are not constant. The eyes may be closed or even wide open. The pupils may be sluggish to light; they may be dilated or contracted or they may be normal. It is of interest to know that both suicide and homicide have been committed by persons said to be in the somnambulistic state.

Nightmare is another extremely interesting and at the same time suggestive modification of consciousness. Here all sorts of odds and ends are thrown together in an illogical and disordered manner. At times the resulting mixture is highly pleasing to the individual who remembers the ebb and flow of thought with pleasure. At other times the stream of consciousness is much agitated and muddy and the individual awakens in great distress under the influence of a bad dream. Such conditions are naturally temporary and may be associated with disordered digestive function. Disagreeable nightmares are also associated with grave cerebral degenerations.

In catalepsy, trance, and lethargy there is a peculiar sluggishness in motor consciousness. The will to move is modified in such a way that there is wax-like rigidity of the limbs. See CATALEPSY.

Hypnosis is an allied form of modified consciousness that is but little understood and largely written about. A very small proportion of the alleged hypnotic phenomena are true, but there seems little question that for a few people most of the time and for many people under certain conditions a certain amount of dissociation of consciousness may be brought about by appropriate physical or psychological stimuli. In this condition people are very highly suggestible and do as others indicate for them what they desire to have done. In other words, they behave largely like tractable children who have no desire or will of their own, for the most part consciously obeying what is told them to do. This phenomenon of modified consciousness is further discussed under hypnotism.

In hysteria and in epilepsy there are often very marked modifications of the conscious state. The phenomena of trance, catalepsy, hypnotism, anæsthesia, etc., are almost constant accompaniments of the hypnotic condition, and automatism and amnesia are also extremely common accompaniments of the hysterical temperament. See HYSTERIA; EPILEPSY.

The phenomena of many of the intoxications are too well known to need description in this place, but they are here spoken of because of the alliance that they show to other forms of disordered mental action. Alcohol, opium, cannabis indica bring about states of consciousness which are modifications of normal conditions, and the poisoning of the bacteria of pneumonia, typhoid, and other infectious diseases also may induce forms of delirium that are extremely suggestive in this connection.

Finally there is a large group of disordered mental states which are classed under one head

CONSCRIPTION — CONSECRATION

as the insanities. These are largely characterized by antisocial conduct, and the disordered states of consciousness vary very widely. Thus in some of the milder forms of paranoia or the minor obsessions perverted consciousness may be present to a very minor degree. In the death-like stages of organic or terminal dementia consciousness is practically wiped out, although the individual eats, drinks, sleeps, and grows fat. See INSANITY.

Conscription, the enlisting of men for military service by a compulsory levy, at the pleasure of the government. It is distinguished from recruiting, or voluntary enlistment. The name is derived from the Roman military constitution. Every Roman citizen was obliged to serve as a soldier from his 17th to his 45th year; the consuls announced every year by a herald or written order that a levy was to be made (*militēs cogere* or *conscribere*); and all citizens capable of bearing arms assembled in the Campus Martius or near the capitol, where the consuls assisted by the legionary tribunes made the levy, choosing as many men as were needed from each tribe. The word conscription as well as the system were introduced into France by the law of 5 Sept. 1778, which declared that every Frenchman was a soldier, and bound to defend the country when in danger. Excepting in times of danger it provided that the army should be formed by voluntary enrollment or by conscription. The conscription included all Frenchmen from 20 to 25 years of age, and the number of conscripts to be called into the service each year was to be determined by the Corps Législatif. Complaints of the conscription did not begin till 1802, on the introduction of a principle of indemnity, by which a payment ranging from 50 to 1,200 francs (\$10 to \$240), according to the annual taxation of the parents of the conscript, secured him exemption.

During the last years of First Empire the conscription was attended with gross abuses in the matter of exemption and substitution, and it was chiefly in consequence of these that on the restoration of the Bourbons it was abolished. It was, however, re-enacted in its substantial features by the law of Marshal Gouvion de St. Cyr, and continued through the revolution of 1848 and the Second Empire. According to a new army bill passed by the national assembly in 1872, the term of service in France was 20 years, but by subsequent enactments this has been extended to 25, namely 3 in the regular army, 10 in the army reserve, 6 in the territorial army, and 6 in the territorial reserve. A youth may volunteer into the army at 18, but at 20 he is compelled to serve, with certain exceptions. The military system of Prussia was extended to the German empire by a law passed in 1887. Its terms in regard to conscription are obligatory service for all subjects, the total length of the service being 12 years, 3 in the active army, 4 in the reserve, and 5 in the landwehr. By the army bill of 1893 the three years' term was reduced to two. The Russian army has been completely remodeled in recent years. It has long been partly raised by conscription, and by a law (subsequently modified) which came into force in 1874 an annual conscription was established, to which all men who have completed their 21st year and are not physically

incapacitated, are liable. The men have to serve in the active army for 5 years, after which they pass into the reserves for 18 more years, during which they are liable to active service only in time of war. In Austria military service is compulsory for all citizens, and the length of service is 12 years, 3 in the standing army, 7 in the reserve, and 2 in the landwehr. In Great Britain volunteer recruiting is commonly found sufficient to raise the contingents needed for the regular army, as well as to keep up the militia required from the several counties. In the United States, both the regular army and the State militia are regularly recruited by voluntary enlistment. During the Civil War compulsory levies were made several times; such levies were always known as drafts, though the term conscription might properly be applied to them. See DRAFTS.

Conscrit de 1813, Histoire d'un (HISTORY OF A CONSCRIPT OF 1813), a famous story, by Erckmann-Chatrian, published 1868-70. The narrative turns mainly on the contrast between the perpetual mourning that is going on in families and the perpetual Te Deums for disastrous victories. This is the dominant note; and in the mouth of the humble conscript, this thesis, interpreted by scenes of daily carnage, is more eloquent and persuasive than if it borrowed arguments from history or philosophy. The style is simple, familiar; but never trivial or commonplace, and is always in harmony with the speaker. As the work was hostile to the Napoleonic legend, numerous obstacles were put in the way of its circulation at the time of publication. But notwithstanding, it was scattered in profusion throughout France by means of cheap illustrated editions.

Consecration, an act by which material things and persons are dedicated to sacred uses and sacred ministries. The word Consecration is also used in the Roman Catholic ritual and liturgy to signify the act by which the bread and wine are in the Mass changed into the body and blood of Christ. In the Roman *Pontificale* or ritual for episcopal functions there is a form for consecration of a bishop, consecration of a church, consecration of the sacred vessels used in the liturgy of the Church. In the consecration of a bishop—ordinarily performed by the metropolitan and two other bishops—the consecrating bishops impose hands on the bishop-elect and the metropolitan delivers to him the pastoral staff and the ring, emblems of his office, and anoints him with chrism, pronouncing the formula of words by which is expressed the commission of authority to rule the Church committed to his charge. The consecration of a church is a very elaborate ceremony, requiring several hours to complete it: there is chanting of the office of Matins and Lauds by the clergy; there are processions of clergy, headed by the consecrating bishop and other bishops who may be present, around the walls outside and thrice around the interior, with continuous chanting of psalms; there is anointing of the doors, of the walls, of the high altar; and a number of other rites. The consecration of the vessels destined for the service of the altar is also an episcopal function: it is a rite that has descended from high Christian antiquity: in this rite also chrism is employed.

CONSENT — CONSERVATORY

Consent, in law, a free and deliberate act of a rational being. Any voluntary act by which the agent takes away his own power of giving a deliberate consent, such as partial intoxication, will not invalidate the consent; but it is invalidated by any undue means—intimidation, improper influence, or imposition—used to obtain it. The law does not, in general, take cognizance of the wisdom or folly of men in entering into contracts before it enforces them; but where clear proof can be brought that a person has been wilfully misled or entrapped into a contract, it will refuse to enforce it.

Consequential Damages, in law, are losses incurred in consequence of an act, but not flowing directly from it. The liability for consequential damages resulting even from an unlawful act is more limited than that for direct damages, as it is evident that the power of the law in tracing and enforcing such damages must be limited; but in some cases they can be enforced.

Conservation, the act of preserving, maintaining, supporting, or protecting. The conservation of energy is a principle based on the general one that energy communicated to a body or system of bodies is never lost; it is merely distributed, and continues to exist as potential energy, as motion or as heat. Faraday directed attention to the subject, Grove elaborately treated it, and it now stands as one of the axioms of physics. It is sometimes called correlation of forces.

Conservation of Energy. See ENERGY.

Conservation of Matter. See MATTER.

Conservative, as applied to one of the two great parties in English politics, was first used by J. W. Croker in an article in the 'Quarterly Review' for January 1830, and was by Macaulay, in the 'Edinburgh Review' for 1832, referred to as a "new cant word." Conservative accordingly began to supersede Tory about the time of the Reform Bill controversies. The plural form of the word, or its equivalent in other tongues, has been assumed as a distinctive name by certain political parties in many nations. These parties are sometimes actually, and always avowedly, opposed to changes from old and established forms and practices. In United States history these names have never been in general use, but in Van Buren's administration the name of Conservatives was applied to those Democrats that at the special session of Congress of September 1837 opposed the establishment of the sub-treasury system. In the Congress that met in December 1839 they had practically disappeared. The name was also assumed by Southern whites during the reconstruction period following the Civil War, to show their adherence to the old State governments, the abolition of which by Congress they opposed. In Virginia the name was in use until 1872. The name was also used at the North during this period. The Democrats applied it to themselves to draw moderate Republican votes. See TORY; WHIG.

Conservatives, in American history. 1. In 1837-40 the name of Conservatives was adopted by seceding Democrats, 4 in the Senate and 14 in the House, who voted with the Whigs against the sub-treasury, though voting with their party on other

questions. They called themselves Conservatives, as wishing to conserve the prosperity of the State banks, which they held the sub-treasury to be a disguised attempt to ruin. They held the balance of power in the House 1837-8, and voted down in two successive sessions Silas Wright's sub-treasury bill, which had been passed by the Senate. The elections of 1838, however, returned only four of them to the House, and these ceased their active opposition—partly because the government had only escaped bankruptcy in 1838, on account of uncollectible claims against banks and individuals, by issuing fresh treasury notes in place of those canceled. The Whigs held the power, and passed the Wright bill in 1840. 2. In the Civil War the Northern Democrats, and especially the border State Democrats, often called themselves Conservatives, as wishing to preserve the old balance of State and national powers; and the name was much ridiculed by the other side. 3. During the Reconstruction period, the Southern whites to a considerable extent took the name of Conservatives as wishing to preserve their old State governments, which they held to have the same existence and sovereignty as before the War, according to the declarations of the Northern leaders and Congress themselves, in stating the purposes of the War. The name, more particularly in Virginia, lasted down to 1872.

Conser'vatory. 1. A systematic school of musical instruction. In Great Britain the term is usually applied to foreign schools of music. Conservatories were originally benevolent establishments attached to hospitals, or other charitable or religious institutions. In Naples there were formerly three conservatories for boys; in Venice four for girls; the Neapolitan group being reduced in 1818 to a single establishment under the name of the Royal College of Music. In Milan a conservatory was established in 1808. In France the musical school established in connection with the Opera received its final organization in 1795 under the name of *Conservatoire de Musique*. Among its teachers have been Méhul, Cherubini, Grétry, Boieldieu, and others of like standing. The Conservatorium founded at Leipsic in 1842 under the auspices of Mendelssohn is perhaps the most influential in Germany, though of late years other schools have pressed closely upon it. Institutions of the same description exist in Warsaw, Prague, Munich, Berlin, and Vienna. Several conservatories have been established in the United States; prominent among them are the National Conservatory in New York and the New England Conservatory at Boston.

2. The glass house in which plants are displayed after being grown in other greenhouse structures; also, any ornamental greenhouse, especially such as are attached to private dwellings for the pleasure of the inmates. In the first sense the house is of great importance to the more pretentious private establishments, since plants brought to perfection may there be placed in an appropriate setting so long as their attractiveness lasts; they cannot be viewed to advantage upon the benches where they are grown. Conservatories are variously arranged internally, some having stationary benches, some rockeries, fountains, etc., and some permanent beds upon the ground. See GREENHOUSE,

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